VISION IAS

Test -8

Ecology & Environment

- Basic Concepts & Components of the Ecology and ecosystem
- Global warming, Climate change and Ozone depletion
- Environmental Issues and Pollution
- Biodiversity, flora and fauna
- Conservation efforts India and World
- Sustainable Development
- Environmental Monitoring and Impact Assessment

+

Current Affairs

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PT - 2022

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Test Booklet Series

TEST BOOKLET

C

GENERAL STUDIES (P) 2022 – Test – 3477

Time Allowed: Two Hours **Maximum Marks: 200**

INSTRUCTIONS

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2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.

3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **Do NOT** write anything else on the Test Booklet.

4. This Test Booklet contains **100** items (Questions). Each item is printed in **English & Hindi.** Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response with you consider the best. In any case, choose **ONLY ONE** response for each item.

5. You have to mark all your responses ONLY on the separate Answer Sheet provided. See direction in the answers sheet.

6. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of **correct responses** marked by you in the answer sheet. For **every incorrect** response **1/3rd of the allotted marks** will be deducted.

7. Before you proceed to mark in the Answer sheet the response to various items in the Test booklet, you have to fill in some particulars in the answer sheets as per instruction sent to you with your Admission Certificate.

8. After you have completed filling in all responses on the answer sheet and the examination has concluded, you should hand over to Invigilator only the answer sheet. You are permitted to take away with you the Test Booklet.

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1. Consider the following differences between Parasitism and Predation:

1. A parasite kills a prey whereas a predator does not cause death to the host.
2. In parasitism the weak feed on the strong while in predation the strong feed on the weak.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

2. With reference to the productivity of an ecosystem, consider the following statements:

1. Gross primary productivity of an ecosystem is the rate of production of organic and inorganic matter.
2. Net primary productivity is the available biomass for consumption to heterotrophs.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

3. Which of the following are effective methods in dealing with air pollution?

1. Washing of coal
2. Replacement of controlled oxygen furnaces with open-hearth furnaces
3. Use of storage tanks with floating roof covers in petroleum refineries

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

4. Which of the following is the correct order of steps involved in Environmental Impact Assessment?

1. Decision making
2. Scoping
3. Screening
4. Impact Prediction

Select the correct answer using the code given below.

(a) 3-1-2-4
(b) 3-2-4-1
(c) 1-4-3-2
(d) 1-2-3-4

5. The species that invade a bare area are called pioneer species. In primary succession in water, which of the following species act as the pioneers?

1. Small phytoplanktons
2. Rooted-floating angiosperms
3. Reed-swamp
4. Marsh-meadow

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 4 only
(d) 1, 2, 3 and 4

6. Recently, the National Research Centre on Yak has tied up with National Insurance Company for insuring Himalayan Yak (Bos grunniens) against the risks posed by weather calamities, diseases, etc. Which of the following statements regarding Himalayan Yak is correct?

(a) Its population in India has increased in the last decade.
(b) It can survive temperatures as cold as minus forty degrees.
(c) Adult Yaks weigh as much as five tonnes.
(d) Yaks are endemic to India.

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7. In the context of ecology, Antibiosis refers to

(a) competition between organisms of the same species.

(b) an association between two species, where one species kills to feed on the other.

(c) a relationship in which one organism is benefited by direct utilization of another.

(d) secretions by an organism which are harmful to others.

8. Which of the following statements is correct regarding the air pollution control device, scrubber?

(a) It separates particulate matter from gases in electric power plants.

(b) It allows settling of the pollutants in a gas to settle down due to the effect of gravity.

(c) It employs spray of water to catch pollutants during emissions.

(d) It imparts electrical charge to the particles that makes them stick to the metallic plates.

9. Which of the following is/are the features of Grassland Ecosystems?

1. Grasslands have a rich variety of animals.
2. Optimum conditions for the growth of trees
3. Soil in grasslands are characterized by thin podzols.

Select the correct answer using the code given below.

(a) 1 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 2 only

10. Consider the following statements with reference to the water harvesting potential of an area:

1. The total amount of water that is received in the form of rainfall over an area is known as water harvesting potential.
2. Unpaved surfaces have a relatively lower water harvesting potential than paved surfaces.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

11. *In these forests, there is no winter, and there are only two seasons (rainy and dry). They have the largest variety of life forms and tree species in all of nature. Trees are 25-35 m tall, with shallow roots and large dark green leaves. Animals in these forests are highly adapted to their diverse environment having developed strong defence mechanisms.*

Which of the following type of forest ecosystem is being described by the above passage?

(a) Tropical Forests

(b) Temperate Forests

(c) Taiga Forests

(d) None of the above

12. Consider the following statements:

1. Biochemical Oxygen Demand (BOD) is a measure of the amount of oxygen required to dissolve organic material in the water.
2. Highly polluted water has a very low BOD value.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

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13. Avicennia marina whose genome has been sequenced recently is a

(a) Tree
(b) Bacteria
(c) Bird
(d) Virus

14. With reference to different levels of organizations in Ecology, consider the following statements:

1. Community only includes the organisms of the same species that are in proximity to one another.
2. Population refers to all the species occupying in a given area.
3. Biome is a large regional ecosystem characterized by similarity in vegetation and climate.

Which of the statements given above is/are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) 1, 2 and 3

15. Which of the following ecological pyramids is/are inverted?

1. Pyramid of numbers in a parasitic food chain
2. Pyramid of biomass in grassland
3. Pyramid of biomass in a pond

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1 and 2 only

16. Consider the following statements regarding the Coconut Development Board of India:

1. It is a statutory body established under the Ministry of Agriculture and Farmers Welfare.
2. Its headquarters is located at Thiruvananthapuram.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

17. A climate agenda called 'Fit for 55' to combat climate change has been launched recently by

(a) Coalition of G-7 countries
(b) European Union
(c) United States of America
(d) Germany

18. Which of the following are potential benefits of coastal marshes and wetlands?

1. They act as migration areas for birds and animals.
2. They purify and recharge groundwater.
3. They prevent contamination of wells in the coastal areas.
4. They protect the coastlines from storms and cyclones.

Select the correct answer using the code given below.

(a) 1, 2, 3 and 4
(b) 1, 2 and 4 only
(c) 2, 3 and 4 only
(d) 1 and 3 only

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19. Which of the following are the components of Photochemical Smog?

1. Ozone
2. Formaldehyde
3. Peroxyacetyl Nitrate (PAN)

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

20. Consider the following statements with respect to ozone depletion:

1. Chlorofluorocarbons (CFCs) are non-toxic organic molecules that help in ozone depletion.
2. Polar stratospheric clouds provide a surface for the reactions causing ozone depletion.
3. Free Chlorine radicals form when CFCs are broken down by UV radiations.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

21. Which of the following are the sources of Nitrogen in an ecosystem?

1. Agricultural land
2. Fossil fuel
3. Livestock
4. Urban waste

Select the correct answer using the code given below.

(a) 1 and 4 only
(b) 2, 3 and 4 only
(c) 1, 2 and 3 only
(d) 1, 2, 3 and 4

22. India's single largest solar park by NTPC (National Thermal Power Corporation) is set to come up in the state of

(a) Gujarat
(b) Rajasthan
(c) Tamil Nadu
(d) Uttar Pradesh

23. Which of the following is/are greenhouse gases (GHG)?

1. Water vapor
2. Carbon Dioxide
3. Nitrous Oxide

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 only
(c) 1 and 3 only
(d) 1, 2 and 3

24. Consider the following statements with respect to oxides of carbon:

1. Carbon Monoxide is produced as a result of the incomplete combustion of carbon.
2. Carbon dioxide forms approximately 3% by volume of the atmosphere.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

25. Consider the following statements with respect to ozone:

1. Tropospheric ozone is a greenhouse gas.
2. Ozone in the stratosphere is a product of UV radiation acting on dioxygen (O_2) molecules.
3. Ozone is thermodynamically stable than oxygen.

Which of the statements given above are correct?

(a) 1 and 3 only
(b) 2 and 3 only
(c) 1 and 2 only
(d) 1, 2 and 3

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26. Which of the following are examples of intraspecific interactions?

1. Aggregation
2. Colonisation
3. Proto-cooperation
4. Symbiosis

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 4 only
(d) 2 and 4 only

27. Which of the following can be the causes of depletion of resources?

1. Non-equitable distribution of resources
2. Technological and Industrial development
3. Overpopulation

Select the correct answer using the code given below.

(a) 1, 2 and 3
(b) 3 only
(c) 2 and 3 only
(d) 1 and 2 only

28. The term 'Zero-Day Vulnerability' often seen in news is related to

(a) cyber security
(b) water scarcity in urban areas
(c) earth's vulnerability to asteriod collision
(d) black hole collapse

29. Which of the following conditions is/are suitable for high rate of decomposition?

1. High Temperature
2. Low Moisture content
3. Detritus rich in nitrogen

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

30. Harit Dhara, which was developed by Indian Council of Agricultural Research recently is a

(a) new basmati rice variety.
(b) feed supplement for livestock.
(c) drought resistant wheat variety.
(d) biogas plant with cow dung as feedstock.

31. Consider the following statements with reference to the conservation of soil:

1. Alternate cropping using grains and legumes increases the fertility of the soil.
2. Use of excess water on farmland can lead to leaching in the soil.
3. Growth of earthworms aids in soil fertility by making the soil more receptive to rainfall.

Which of the statements given above is/are correct?

(a) 1, 2 and 3
(b) 1 and 3 only
(c) 2 only
(d) 1 and 2 only

32. Consider the following statements:

1. Littoral zone is topmost zone near the shore of a lake or pond.
2. Limnetic zone is well-lit and is dominated by planktons.
3. Profundal zone is much colder and denser than the other zones.

Which of the statements given above is/are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) 1, 2 and 3

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33. Consider the following statements regarding Biogas:

1. It is produced by the fermentation of biodegradable materials such as biomass, manure, municipal waste and green waste in the presence of air.
2. It primarily consists of methane and carbon dioxide.
3. It has very low calorific value and cannot be used as a fuel

Which of the statements given above is/are ***not*** correct?

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 2 only

34. Consider the following pairs:

Type of Pollutant		***Disease Caused***
1. Arsenic	:	Cholera
2. Mercury	:	Itai-Itai
3. Cadmium	:	Minamata Disease

Which of the pairs given above is/are correctly matched?

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) None

35. Consider the following:

1. Styrofoam CD and DVD cases
2. Leather bags
3. Plastic toys
4. Synthetic pesticides

Which of the above mentioned waste products fall in the category of non-biodegradable wastes?

(a) 1, 2 and 4 only
(b) 1, 3 and 4 only
(c) 2 and 3 only
(d) 1, 2, 3 and 4

36. India has been ranked 10th in the latest Global Cybersecurity Index (GCI), 2020. GCI is released by

(a) Global Cyber Alliance
(b) International Telecommunication Union
(c) Internet Society
(d) International Cyber Security Protection Alliance

37. "It is a Greenhouse gas. It is released in large amounts in paddy fields, coal mines, from rotting garbage dumps. It is associated with chemical reactions leading to the destruction of ozone. It is also used as biogas." It is

(a) Nitrous Oxide
(b) Methane
(c) Chlorofluorocarbon
(d) Carbon dioxide

38. Consider the following statements about the National Board for Wildlife:

1. It is a statutory body, established under the Wildlife Protection Act, 1972.
2. It is headed by the Minister-in-charge of Environment, Forest, and Climate Change (MoEFCC).

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

39. Which of the following organisms act as a biological agent in increasing the plant growth of farmland?

1. Praying Mantis
2. Desert Locusts
3. Chalcid Wasps
4. Soldier Beetle

Select the correct answer using the code given below.

(a) 1, 2, 3 and 4
(b) 1, 3 and 4 only
(c) 1 and 4 only
(d) 2 and 4 only

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40. Which of the following measures can be taken to avoid over-exploitation of resources?

1. Use of bio-fertilisers and bio-pesticides
2. Use of high yielding variety seeds
3. Avoiding use of non-degradable materials

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

41. Consider the following statements about the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):

1. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
2. It is legally binding on the Parties and it does not take the place of national laws.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

42. Homeostasis phenomenon is related to which of the following?

(a) The ability of an organism to achieve stability through change.
(b) Self-regulating process by which an organism tends to maintain stability.
(c) A state of minimal activity and metabolic depression.
(d) The unidirectional flow of energy through the ecosystem.

43. In the carbon cycle, which of the following processes add carbon dioxide to the atmosphere?

1. Decomposition of organic matter
2. Respiration by plants
3. Burning of fossil fuels
4. Photosynthesis by plants

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1, 3 and 4 only
(d) 1, 2 and 3 only

44. Which of the following conditions are favourable for the development of hydroelectricity?

1. A mountainous area or an upland region.
2. Silt free and uniform source of water.
3. Presence of industrial zones in the close vicinity.

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

45. Which of the following may be the implications of the destruction of forest cover?

1. Reduction in the oxygen
2. Loss of biodiversity
3. Lowering of water table

Select the correct answer using the code given below.

(a) 1 and 3 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

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46. These are called the "*rainforests of the ocean*". They cannot survive above water level and are mostly confined between 25 degrees North and South on the globe. They are generally attached to submarine platforms of islands that are submerged.

Which of the following is best described by the passage given above?

(a) Phytoplanktons
(b) Mangroves
(c) Coral Reefs
(d) Seagrass

47. Which of the following measures can be taken for the abatement of soil pollution?

1. Sanitary Landfills
2. Increased use of pesticides
3. Composting

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 only
(c) 1 and 3 only
(d) None of the above

48. With reference to the ecosystem, which of the following correctly describes the 'standing state'?

(a) Amount of dry biomass present in an ecosystem at any given time
(b) The total number of microorganism species in an ecosystem.
(c) Amount of inorganic nutrients found in an ecosystem.
(d) Amount of annual rainfall received within the boundaries of an ecosystem.

49. Which of the following is/are the adaptation features found in plants and animals of the Desert ecosystem?

1. Hard and thick waxy leaves.
2. Long and spreading root systems
3. Concentrated body fat
4. Overactive sweat glands

Select the correct answer using the code given below.

(a) 2 and 4 only
(b) 1 and 3 only
(c) 1, 2 and 4 only
(d) 1, 2 and 3 only

50. Which of the following can be determined by counting the pugmarks in a defined area?

1. Presence of different species in the area.
2. Age of different species.
3. Sex ratio of different species
4. Identification of Individual animals

Select the correct answer using the code given below.

(a) 1, 2 and 4 only
(b) 3 and 4 only
(c) 1 and 2 only
(d) 1, 2, 3 and 4

51. With reference to Genetic Biodiversity, consider the following statements:

1. It refers to the variation of genes among different species.
2. Higher genetic biodiversity leads to lesser flexibility in adaptation to environmental changes.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

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52. Discharge of which of the following into waterbodies can cause Eutrophication?

1. Domestic Sewage
2. Industrial effluents
3. Agricultural fertilizers

Select the correct answer using the code given below.

(a) 1 and 3 only
(b) 2 and 3 only
(c) 1 and 2 only
(d) 1, 2 and 3

53. The Mekedatu project which is recently seen in the news is a proposed project on the river

(a) Beas
(b) Cauvery
(c) Krishna
(d) Mahanadi

54. Consider the following statements about Central Pollution Control Board (CPCB):

1. It can advise the Central Government on any matter related to the prevention and control of water and air pollution.
2. It has a network of Zonal offices called State Pollution Control Boards.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

55. Uttar Pradesh, the largest populated state of India has recently brought out a draft bill on population control and has ignited a debate on population control. In this context, arrange the population of the following states as per census 2011 in the increasing order.

1. Tamil Nadu
2. Bihar
3. Karnataka
4. Madhya Pradesh

Select the correct answer using the code given below.

(a) 3-1-4-2
(b) 3-1-2-4
(c) 1-3-4-2
(d) 1-3-2-4

56. Consider the following statements about the Wildlife Protection Act, 1972:

1. It provides for the appointment of Chief Wildlife Warden by the Central Government.
2. It prohibits the development of new ex-situ conservation areas like new Zoological and Botanical Gardens.
3. It was enacted for the protection of both plants and animal species.

Which of the statements given above is/are correct?

(a) 1 and 2 only
(b) 3 only
(c) 1, 2 and 3
(d) 1 and 3 only

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57. Consider the following statements with regard to the harmful effects of chemicals in drinking water:

1. Excessive sulfate in drinking water causes the blue baby syndrome.
2. Deficiency of Fluorine in drinking water causes tooth decay.
3. High concentration of Lead in drinking water can damage the kidney and liver.

Which of the statements given above is/are ***not*** correct?

(a) 1 only
(b) 3 only
(c) 2 and 3 only
(d) 1 and 2 only

58. Which of the following international organizations, categorises the animal species and publishes the Red List of Threatened Species?

(a) UNEP
(b) Word Wide Fund for Nature
(c) International Union for Conservation of Nature
(d) CITES

59. Which of the following explains the shorter ears and limbs of mammals from colder climates to minimize heat loss?

(a) Bergman's rule
(b) Gause's Hypothesis
(c) Allen's Rule
(d) Gloger's rule

60. Consider the following statements regarding the Kumbhalgarh Wildlife Sanctuary often seen in the news:

1. It is a tiger reserve with the highest density of tigers in India.
2. It is located in Rajasthan.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

61. Near-Earth Asteroid Scout or NEA Scout is a spacecraft set to be launched by

(a) European Space Agency
(b) National Aeronautics and Space Administration
(c) CNES, France
(d) JAXA, Japan

62. The newly proposed Lemru Elephant Reserve to reduce man-elephant conflict is located in:

(a) Jharkhand
(b) Chhattisgarh
(c) Maharashtra
(d) Odisha

63. Which of the following is/are the department(s) of the Ministry of Finance?

1. Department of Public Enterprises
2. Department of Investment and Public Asset Management
3. Department for Promotion of Industry and Internal Trade

Select the correct answer using the code given below.

(a) 2 only
(b) 1 and 2 only
(c) 1 and 3 only
(d) 1, 2 and 3

64. Which of the following best defines the term Biomagnification?

(a) Depletion of oxygen from water bodies occurring both due to natural and anthropogenic reasons
(b) Increase in concentration of toxic substances along the food chain
(c) Increase in heat loss at every stage in the foodchain
(d) Increase in the nitrogenous waste in the water bodies due to waste water from the agricultural sector

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65. Consider the following phases of disposal of waste using sanitary landfill system:

1. Aerobic bacteria deplete the available oxygen
2. Establishment of Methanogenic activity
3. Establishment of Anaerobic conditions
4. Depletion of organic matter

Arrange the above phases in the correct chronological order of their occurrence.

(a) 1-2-3-4
(b) 2-1-3-4
(c) 1-3-2-4
(d) 3-2-1-4

66. Consider the following statements with reference to the flow of energy in a food chain:

1. Energy flow in a food chain is always unidirectional in nature
2. The loss of energy at each trophic level is in the range of 10-15 percent.
3. Higher the trophic level the greater is the available energy.

Which of the statements given above is/are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 only
(d) 1, 2 and 3

67. Which of the following characteristics are associated with a eutrophic lake?

1. Low amount of nutrients
2. Loss of Biodiversity
3. High amount of dissolved oxygen
4. Excessive growth of algae

Select the correct answer using the code given below.

(a) 2 and 4 only
(b) 1 and 3 only
(c) 1, 2 and 4 only
(d) 2, 3 and 4 only

68. The Animal Welfare Board was established under which of the following Act?

(a) The Wildlife Protection Act, 1972
(b) The Biological Diversity Act, 2002
(c) The Prevention of Cruelty to Animals Act, 1960
(d) The Environment Protection Act, 1986

69. Mahananda river which is an important tributary of river Ganga flows through the states of

1. Bihar
2. Uttar Pradesh
3. West Bengal

Select the correct answer using the code given below.

(a) 1 only
(b) 2 only
(c) 1 and 3 only
(d) 1, 2 and 3

70. Which of the following causes are responsible for Desertification?

1. Lack of vegetation cover
2. Water erosion
3. Slash and burn agriculture
4. Overgrazing

Select the correct answer using the code given below.

(a) 1, 2 and 3 only
(b) 2 and 4 only
(c) 1, 3 and 4 only
(d) 1, 2, 3 and 4

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71. Consider the following statements with reference to the Indian Forest Act, 1927:

1. It regulates the movement of forest produce, and the duty leviable on forest produce.
2. It explains the procedure to be followed for declaring an area as Reserved Forest.
3. The State Government can assign to any village community the rights of government over any land of a reserve forest.

Which of the statements given above is/are correct?

(a) 3 only
(b) 1 and 3 only
(c) 1 and 2 only
(d) 1, 2 and 3

72. Which of the following pollutants can be classified as toxic particulate material?

1. Lead
2. Cadmium
3. Mercury
4. Asbestos
5. Nickel

Select the correct answer using the code given below.

(a) 1, 3 and 5 only
(b) 1, 2, 3 and 4 only
(c) 1, 4 and 5 only
(d) 1, 2, 3, 4 and 5

73. Which of the following statements is ***not*** correct with respect to acid rain?

(a) Acid rain is resulted from the emission of oxides of sulphur and nitrogen.
(b) Acid rain dissolves and washes away nutrients needed for the growth of crops.
(c) Acid rain has a pH value of between 6 and 7.
(d) Acid rain corrodes water pipes resulting in the leaching of heavy metals into drinking water.

74. Which of the following states in India have potential for wind energy generation?

1. Andhra Pradesh
2. Gujarat
3. Maharashtra
4. Tamil Nadu

Select the correct answer using the code given below.

(a) 1, 2 and 3 only
(b) 2 and 3 only
(c) 3 and 4 only
(d) 1, 2, 3 and 4

75. Which of the following statements is/are correct about biodiversity hotspots?

1. It represents floral and faunal endemicity in a region.
2. It is declared by the World Wide Fund for Nature (WWF) in association with the International Union for Conservation of Nature (IUCN).

Select the correct answer using the code given below.

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

76. Consider the following statements about the effect of frost on the growth of plants:

1. It increases the concentration of salts in the cell.
2. It leads to the formation of canker disease.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

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77. Which of the following are examples of a lotic water ecosystem?

1. Springs
2. Swamps
3. Marshes
4. Streams

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 4 only
(c) 1 and 3 only
(d) 1 and 4 only

78. With reference to the various steps involved in the process of decomposition, consider the following pairs:

Process		***Description***
1. Leaching	:	Percolation of inorganic nutrients into the soil
2. Mineralisation	:	Degradation of detritus into simpler inorganic substances
3. Catabolism	:	Degradation of humus by microbes

Which of the pairs given above is/are correctly matched?

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

79. Which of the following are the likely impacts of ecosystem destruction?

1. Increasing evapo-transpiration
2. Declining levels of underground water-table
3. Loss of species and biomass

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

80. Consider the following pairs:

Biotic Interactions		***Example***
1. Predation	:	Pitcher plant consuming insect
2. Competition	:	Plants in evergreen forest
3. Parasitism	:	Cattle egret and grazing cattle
4. Amensalism	:	Sparrow eating seeds

Which of the pairs given above are correctly matched?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 and 4 only
(d) 1, 2, 3 and 4

81. Consider the following statements about The Water (Prevention and Control of Pollution) Act,1974:

1. It defines both, water pollution and water quality standards.
2. It provides for maintenance and restoration of quality of all types of surface and groundwater.
3. It authorizes the Department of Water Resources, River Development & Ganga Rejuvenation to implement the work for the objectives of the Act.

Which of the statements given above is/are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) None

82. Which of the following countries shares a border with the Black Sea?

(a) Greece
(b) Georgia
(c) Azerbaijan
(d) Macedonia

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83. With reference to ecological food chains, consider the following statements:

1. A grazing food chain starts with the decomposition of organic wastes and dead matter.
2. The energy transmitted remains constant at each trophic level throughout a food chain.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

84. Which of the following countries are the members of Mekong-Ganga Cooperation?

1. India
2. Thailand
3. Malaysia
4. Vietnam

Select the correct answer using the code given below.

(a) 1, 2 and 3 only
(b) 2, 3 and 4 only
(c) 1, 2 and 4 only
(d) 1, 3 and 4 only

85. In an ecological succession, the entire sequence of communities that successively change in a given area is called sere. In the successive seral stages, which of the following parameters witness an increase?

1. Number of species
2. Number of organisms
3. Total biomass

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) 1, 2 and 3

86. Consider the following statements regarding Monkey B virus or Herpes B virus :

1. It is transmitted only through contaminated monkey blood.
2. Currently, there is no vaccine against this virus.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

87. Consider the following statements about Wildlife Crime Control Bureau:

1. It is a statutory body created under the Ministry of Environment, Forest, and Climate Change.
2. It assists foreign authorities and international organizations concerned to facilitate coordination and universal action for wildlife crime control.

Which of the statements given above is/are ***not*** correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

88. Consider the following statements with reference to solar energy:

1. Solar energy can be directly converted into electricity using a photovoltaic cell.
2. Solar energy in the form of thermal energy can be used for water heating systems, dryers and refrigeration.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 or 2

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89. With reference to marine ecosystems, consider the following statements:

1. The aphotic zone in the marine ecosystem is absolutely devoid of traces of life.
2. The waves and tides produced by the pull of the moon have no influence over marine ecosystems.

Which of the statements given above is/are ***not*** correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

90. Which of the following are the reasons/factors for exposure to Particulate Matter (PM) pollution?

1. Tobacco smoke
2. Pulverization of Coal
3. Spraying of Pesticides
4. Dust storms
5. Sandblasting

Select the correct answer using the code given below.

(a) 1, 2 and 3 only
(b) 2 and 4 only
(c) 1, 3 and 4 only
(d) 1, 2, 3, 4 and 5

91. Consider the following pairs:

State		***Traditional Water Harvesting system***
1. Karnataka	:	Kere
2. Rajasthan	:	Kunds
3. Nagaland	:	Zing

Which of the pairs given above is/are correctly matched?

(a) 1 and 2 only
(b) 3 only
(c) 1 and 3 only
(d) None

92. Which of the following components are included in the Integrated Watershed Management?

1. Management of soil and water
2. Development of Agro-forestry
3. Development of fodder for cattle

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 2 only
(d) 1, 2 and 3

93. Project BOLD which aims to create bamboo-based green patches in arid and semi-arid areas of India has been launched by

(a) Arid Forest Research Institute, Jodhpur
(b) Forest Research Institute, Dehradun
(c) Indian Institute of Forest Management
(d) Khadi and Village Industries Commission

94. Which of the following are the applications of Phosphorus mineral?

1. Fertilizers
2. Detergents
3. Medicines
4. Steel Production
5. Safety matches

Select the correct answer using the code given below.

(a) 1, 2 and 4 only
(b) 2, 3 and 5 only
(c) 1, 3, 4 and 5 only
(d) 1, 2, 3, 4 and 5

95. The systematic search for biochemical and genetic information in nature in order to develop commercially valuable products for pharmaceutical, agricultural, cosmetic and other applications refers to:

(a) Bio-piracy
(b) Bioprospecting
(c) Biopatenting
(d) None of the above

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96. Consider the following statements regarding the Revamped Distribution Sector Scheme for DISCOMs :

1. Private sector DISCOMs are not included for assistance under this scheme.
2. Indian Renewable Energy Development Agency (IREDA) is the nodal agency for implementing this scheme.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

97. Which of the following cities in India is/are selected by UNESCO under its 'Historic Urban Landscape' project?

1. Jodhpur
2. Gwalior
3. Orchha

Select the correct answer using the code given below.

(a) 3 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

98. This National Park was formed by including the areas of erstwhile Venugopala Wildlife Park. It was brought under Project Tiger in 1973. It together with Mudumalai Wildlife Sanctuary and Wayanad Wildlife Sanctuary constitute Nilgiri Biosphere Reserve. It is also home to species like gaur, mouse deer, sloth bear, and Malabar squirrel, etc.

The above-mentioned passage refers to which of the following National Park?

(a) Bandipur National Park
(b) Nagarhole National Park
(c) Bannerghatta National Park
(d) Mathikettan Shola National Park

99. Which of the following statements is ***not*** correct about The Air (Prevention and Control of Pollution) Act, 1981?

1. It provides for the establishment of the Central Pollution Control Board.
2. It includes noise as an air pollutant.
3. Any air pollutant into the atmosphere by a ship or aircraft does not come under the purview of this Act.

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 2 only
(d) 1, 2 and 3

100. Consider a situation in which a parasitic bird lays its eggs in the nest of its host and lets the host incubate them. During the course of evolution, the eggs of the parasitic bird have evolved to resemble the host's egg in size and color to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest.

Which type of parasitism is being described in the above situation?

(a) Endoparasitism
(b) Brood parasitism
(c) Ectoparasitism
(d) Obligate Parasitism

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Q 1.B

- Predation and parasitism are two types of negative biotic interactions between the organisms living in the Earth.
  - Parasitism is an interaction between a parasite and a host in which the former obtains benefits at the cost of later. **A parasite does not cause the death of the host. Whereas Predation is an association between two species, where one species (predator) kills to feed on the prey. Hence, statement 1 is not correct.**
  - In Parasitism the weak feed on the strong while in predation it is strong that feeds on the weak. **Hence, statement 2 is correct.**
  - For example, Glochidium larva attaches to the fins of a fish is an example of parasitism and Birds feeding on fish is an example of predation.

Q 2.B

- The **Gross primary productivity** of an ecosystem is the rate of production of organic matter during photosynthesis. **Hence, statement 1 is not correct**.
- A considerable amount of GPP is utilized by plants in respiration. Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP).
  - GPP – R = NPP
- **Net primary productivity** is the available biomass for the consumption of heterotrophs (herbivores and decomposers). **Hence, statement 2 is correct.**
- Secondary productivity is defined as the rate of formation of new organic matter by consumers.
- Primary productivity depends on the plant species inhabiting a particular area. It also depends on a variety of environmental factors, availability of nutrients and photosynthetic capacity of plants. Therefore, it varies in different types of ecosystems.
- The annual **net primary productivity of the whole biosphere** is approximately **170 billion tons** (dry weight) of organic matter. Of this, despite occupying about 70 percent of the surface, the **productivity of the oceans is only 55 billion tons**. The remaining productivity is on land.

Q 3.B

- **Option 1 is correct.** Change of process is one of the source correction methods used in the abatement of air pollution. Changing or modifying the process of production can help in lowering atmospheric pollutants. For example, **coal is washed before pulverizing it to reduce fly ash emissions**.
- **Option 2 is not correct and option 3 is correct.** Existing equipment can be modified to reduce/control undesirable emissions.
  - If **open-hearth furnaces** are replaced with **controlled basic oxygen/electric furnaces** then the emission of carbon monoxide, smoke and fumes can be reduced.
  - In **petroleum refineries**, **loss of hydrocarbon vapours from storage tanks** (due to evaporation or temperature change) can be reduced by designing storage tanks with floating roof covers.

Q 4.B

- **Environmental Impact Assessment (EIA)** is a process that involves the evaluation of the environmental impacts of proposed projects. It takes into account impacts (both beneficial and adverse) of various factors such as inter-related socio-economic, cultural, and human health impacts. It aims to reduce adverse impacts by predicting environmental impacts at an early stage in project planning and design. It helps to shape projects to suit the local environment and present the predictions and options to decision-makers. It is a cyclical process that involves the following steps:

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- **Screening**: The project plan is screened for statutory clearance if needed, the scale of investment, type of development, and location.
- **Scoping**: The potential impacts and mitigation possibilities in zones of impact along with the need for monitoring.
- **Collection of baseline data**.
- I**mpact prediction**: Impacts of all kinds-Positive and negative, reversible and irreversible, and temporary and permanent are predicted.
- **Mitigation measures and EIA report**: It includes the actions and steps for preventing, minimizing the impacts
- **Public hearing**: Public and environmental groups living close to the project site may be informed and consulted on the completion of the EIA report.
- **Decision making:** Experts along with Impact Assessment Authority take the final decision.
- **Monitoring and implementation of environmental management plan**: The various phases of implementation of the project are monitored.
- **Assessment of Alternatives, Delineation of Mitigation Measures**: For every project, possible alternatives should be identified, and environmental attributes compared.
- **Risk assessment:** Inventory analysis and hazard probability and index also form part of EIA procedures.

Q 5.A

- Ecological succession is the process that describes how the structure of a biological community (that is, an interacting group of various species in a desert, forest, grassland, marine environment, and so on) changes over time. There are two types of succession:
  - Primary Succession - Succession that begins in new habitats or lifeless areas that are uninfluenced by pre-existing communities.
  - Secondary Succession - Succession that follows the disruption of a pre-existing community that existed in the same ecosystem.
- The species that invade a bare area are called pioneer species.
- **Primary succession on rocks**
  - These are usually lichens which are able to secrete acids to dissolve rock, helping in weathering and soil formation.
  - These later pave the way for some very small plants like bryophytes, which are able to take hold in the small amount of soil. They are, with time, succeeded by higher plants, and after several more stages, ultimately a stable climax forest community is formed.
  - The climax community remains stable as long as the environment remains unchanged. With time the xerophytic habitat gets converted into a mesophytic one.
- **Primary succession in water**
  - **The pioneers are the small phytoplankton. Hence option 1 is correct.**
  - Phytoplanktons are **gradually replaced** with time by rooted-submerged plants,**rooted-floating angiosperms** followed by free-floating plants, **then reed-swamp, marsh-meadow**, scrub and finally the trees. **Hence, options 2, 3 and 4 are not correct.**
  - The climax again would be a forest. With time the water body is converted into land

Q 6.B

- The Himalayan Yak (Bos grunniens) is a long-haired domesticated cattle found throughout the Himalayan region of India.
- The increasing trend of temperature at high altitudes and heat stress in Himalayan Yak during warmer months of the year is resulting in frequent deaths of Himalayan Yak which is also causing a financial burden on yak owners.
- **The countrywide population trend also shows that the Yak population has been decreasing at an alarming rate. As per the 20th livestock census, the Yak population is just 58,000 down from around 80,000 in 2012. Hence option (a) is not correct.**
- To arrest this trend, recently National Research Centre on Yak (NRCY) at Dirang in Arunachal Pradesh's West Kameng district has tied up with the National Insurance Company Ltd. for insuring this gentle giant and providing relief to the owners.
  - NRCY, was established in 1989 by the Indian Council of Agricultural Research.
- **Yak is accustomed to very cold temperatures and can survive up to minus 40 degrees but finds it difficult when the temperature crosses 13 degrees. Hence, option (b) is the correct answer.** Yak can

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efficiently conserve its body heat during cold weather conditions and has minimal body mechanism to dissipate heat by way of sweating.

- **Domestic Yaks weigh from 400 to 550 Kilograms. Wild yaks are much larger, sometimes weighing up to 1200 Kilograms. Males are larger than females, with more massive horns. Hence option (c) is not correct.**
- **Yak is found throughout the Himalayan region of the Indian subcontinent, the Tibetan Plateau, Northern Myanmar, Yunnan, Sichuan and as far north as Mongolia and Siberia. Thus it is not endemic to India. Hence option (d) is not correct.**

Q 7.D

- Organisms living in this earth are interlinked to each other in one way or other. The interaction between the organisms is fundamental for the survival and functioning of the ecosystem as a whole.
- **Antibiosis is a negative interaction in which an organism produces harmful secretions. In this type of relationship, none of the population is benefited. Hence, option (d) is correct.**
- For example, some species of blue-green algae that grows in ponds produce toxic substances that kilt fishes as well. In marine waters, the population of some microbes popularly known as red tide cause the destruction of fish and other animals.
- Intraspecific competition is the competition between organisms of the same species.
- Predation is an association between two species, where one species kills to feed on the other.
- Exploitation is the relationship in which one organism is benefited by direct utilization of another

Q 8.C

- **A Filter** separates particulate matter from gases in electric power plants. The smoke passes through a series of cloth bags which trap the particulate matter.
- **Gravitational Settling Chambe**r consists of huge rectangular chambers. The polluted gas stream is allowed to enter from one side. The horizontal velocity of the gas stream is kept at a very low level to give time for the particles to settle down by gravity.
- **The scrubber** is a device that uses a spray of water to catch pollutants during emissions. A dry scrubber is used to remove acid gases. This process includes spraying wet lime powder into the hot exhaust chamber. The scrubber uses this lime to neutralise acid gases. **Hence option (c) is the correct answer.**
- **Electrostatic Precipitator** helps in controlling pollution by removing many chemicals. It removes the particles from the smoke only after the combustion has taken place. It imparts an electrical charge to the particles that make them stick to the metallic plates inside the precipitator.

Q 9.A

- Grasslands are found on every continent except Antarctica. These terrestrial ecosystems occupy roughly 19 percent of the earth's surface. They are characterised by treeless herbaceous plants dominated by a wide variety of grass
- **Features of Grasslands:**
  - The grasslands are found where rainfall is about 25-75 cm per year, **not enough to support a forest,** but more than that of a true desert. Typical grasslands are vegetation formations that are generally found in temperate climates.
  - Grasslands are dominated by grasses. **Large shrubs or trees are not found. Hence, statement 2 is not correct.**
  - Grasslands have a rich variety of animals. **Hence, statement 1 is correct.**
  - The soil is always exposed, sometimes rocky but more often sandy with fixed or mobile dunes. Forage is available only during the brief wet season. Boreal forest soils are characterized by thin podzols. **Hence, statement 3 is not correct.**
  - Grasslands have been the home for grazing animals for millions of years.

Q 10.D

- The total amount of water that is received in the form of rainfall over an area is called the **rainwater endowment of that area**. Out of this, the amount that **can be effectively harvested is called the water harvesting potential. Hence statement 1 is not correct.**
- **Water Harvesting Potential = Rainfall in the area x Collection efficiency of the area.**
- Runoff depends upon the area and type of the catchment over which it falls as well as surface features.
- Paved Surface means a constructed, hard, smooth surface made of asphalt, concrete, or other pavement material.

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- **Unpaved surfaces have a greater capacity of retaining rainwater thus better collection efficiency. Higher is the collection efficiency of an area, greater is the water harvesting potential.** Such surfaces also lead to a natural recharge of groundwater and thus better water harvesting levels. **Hence statement 2 is not correct.**

Q 11.A

- A forest ecosystem is composed of trees, shrubs or any other woody vegetation with closed canopy cover. These are usually found in regions where there is plenty of rainfall.
- **Tropical Forests:**
  - **In Tropical forests, there is no winter, and there are only two seasons (rainy and dry).** The length of daylight is 12 hours and varies little.
  - **In Tropical Forests one square kilometre may contain as many as 100 different tree species. Trees are 25-35 m tall, with shallow roots, mostly evergreen, with large dark green leaves.** Plants such as orchids, bromeliads, vines, ferns, mosses, and palms are present in tropical forests.
  - **Tropical forests have the largest variety of life forms in all of nature,** with thousands of different species of mammals, birds, reptiles, amphibians and insects. **Many of the animals in these forests are highly adaptive to their diverse environment having developed camouflage and strong defences.**
- **Hence option (a) is the correct answer.**
- **Temperate forests**
  - Temperate forests have a wide range of temperatures that correlate with the distinctive seasons. Temperatures range from hot in the summer, with highs of 30dec C, to extremely cold in the winter, with lows of -30^{O}C.
  - Temperate forests receive abundant amounts of precipitation, usually between 20 and 60 inches of precipitation annually. This precipitation is in the form of rain and now.
  - They are characterized with a variety of deciduous trees. Decreasing temperatures and shortened daylight hours in fall mean decreased photosynthesis for plant.
- **Taiga Forests**
  - The taiga is sometimes called the boreal forest or the coniferous forest. It is the largest of all the land biomes.
  - The taiga is the driest and coldest of the three.
  - This forest is covered with evergreen, or coniferous, trees.
  - The taiga has the coldest weather of the forest biomes. Winters can get as cold as -50^{O}C. Winter can last for six months with the temperature averaging below freezing. Summers are warmer, but very short.
  - The precipitation is only slightly more than the desert or the tundra. Average precipitation is between 12 and 30 inches per year. It falls as rain in the summer and snow in the winter.
  - The layer of good soil is thin because the leaves don't fall from the trees, like in the temperate forest.

Q 12.A

- The large population of **bacteria decomposes organic matter** present in water. They consume oxygen dissolved in water. The amount of oxygen that water can hold in the solution is limited. Even a moderate amount of organic matter when decomposes in water can deplete the water of its dissolved oxygen. The concentration of dissolved oxygen in water is very important for **aquatic life.** If the concentration of dissolved oxygen in water is below 6 ppm, the growth of fish gets inhibited. If too much organic matter is added to water, all the available oxygen is used up.
- Thus, the amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water is called **Biochemical Oxygen Demand (BOD).** The amount of BOD in the water is a measure of the amount of organic material in the water, in terms of how much oxygen will be required to break it down biologically. **Clean water would have a BOD value of less than 5 ppm** whereas **highly polluted water** could have a **BOD value of 17 ppm** or more. **Hence statement 1 is correct and statement 2 is not correct.**

Q 13.A

- **Recently, scientists at the Department of Biotechnology (DBT)-Institute of Life Sciences, Bhubaneswar have reported a reference-grade whole genome sequence of a highly salt-tolerant and salt-secreting true-mangrove species called Avicennia marina.**
- **Commonly referred to as grey mangrove or white mangrove, Avicennia Marina is a shrub or tree belonging to the Acanthaceae family that are generally 10–14 m long.**

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- Avicennia marina is among the rare plant species that can experience stunted growth in water conditions that are too saline. It grows to its full height in waters where both salt and freshwater are present. This species can tolerate high salinity by excreting salts through its leaves. It also can tolerate extreme weather conditions, high winds, along with various pests and diseases.
- The salt tolerating properties of this species can be of immense use in increasing agricultural productivity by developing salt-tolerant crop varieties of rice, wheat, etc with the help of genetic engineering.
- **Hence option (a) is the correct answer.**

Q 14.C

- **Levels of Organization in Ecology**
  - **Organism:** An organism is a fundamental functional unit in ecology because it interacts directly with the environment as well as with other organisms, e.g., a rabbit
  - **Population: It refers to the organisms of the same species that are in proximity to one another,** e.g., a group of rabbits. **Hence, statement 2 is not correct.**
  - **Community: It includes all the populations occupying a given area**. The size of a community depends on our scale of reference. The community and the non-living environment together are referred to as an ecological system or ecosystem, e.g., a pond with fish and plants. **Hence, statement 1 is not correct.**
  - **Biome: It refers to a large regional or subcontinental ecosystem characterized by similarity in vegetation and climate.** It is made of many similar ecosystems. An ecosystem is much smaller than a biome. For example, a grassland biome implies many ecosystems that are similar because grasses are, their principal plants and grazers are their predominant animals. **Hence, statement 3 is correct.**

Q 15.C

- The ecological pyramids are of three categories.
  - Pyramid of numbers,
  - Pyramid of biomass, and
  - Pyramid of energy or productivity
- **Pyramid of Numbers:**
  - This deals with the relationship between the numbers of primary producers and consumers of different levels. It is a graphic representation of the total number of individuals of different species, belonging to each trophic level in an ecosystem.
  - In a forest or lake ecosystem, the pyramid is always in an upright position. **However, the pyramid of Numbers in a parasitic food chain is inverted. For example, a single tree supports many fruit-eating birds. These birds support more numbers of parasites like lice. These parasites support a large variety of other parasites like bacteria and fungi. Hence option 1 is correct.**
- **Pyramid of Biomass:**
  - In this approach individuals in each trophic level are weighed instead of being counted. This gives us a pyramid of biomass, i.e., the total dry weight of all organisms at each trophic level at a particular time.
  - Pyramid of biomass is usually determined by collecting all organisms occupying each trophic level separately and measuring their dry weight.
  - In many ecosystems, such as in forests and grasslands, the biomass of producers is much greater than that of the herbivores, which in turn outweigh the carnivores and so on. Thus, we experience a gradual decline in the biomass of organisms at each hierarchic trophic level. These pyramids are in an upright position. **Hence option 2 is not correct.**
  - **However, in a pond ecosystem, producers are small organisms, so their biomass is also less. But the primary and secondary consumers are bigger, so their biomass is more. Therefore, the value of biomass shows a gradual increase, making it an inverted pyramid. Hence option 3 is correct.**
- **Pyramid of Energy:**
  - An energy pyramid, reflects the laws of thermodynamics, with conversion of solar energy to chemical energy and heat energy at each trophic level and with loss of energy being depicted at each transfer to another trophic level. Hence the pyramid is always upward, with a large energy base at the bottom.

Q 16.A

- **Recently, the Government of India has decided to amend the Coconut Development Board Act, 1979 to make the post of Chairman as Non-Executive one as part of its efforts to boost production and productivity in this sector.**
- **Coconut Development Board (CDB) is a statutory body which came into existence on 12th January 1981 and functions under the administrative control of the Ministry of Agriculture and Farmers Welfare. Hence, statement 1 is correct.**

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- It works as per the provisions of the **Coconut Development Board Act, 1979 f**or the integrated development of coconut cultivation and industry in the country with a focus on productivity increase and product diversification**.**
- The Board
- **Its Headquarters is located at Kochi, Kerala and regional Offices at Bangalore in Karnataka, Chennai in Tamil Nadu, Guwahati in Assam and Patna in Bihar. Hence, statement 2 is not correct.**
- The Board has also set up a Technology Development Centre at Vazhakulam near Aluva in Kerala and a Field office at Thiruvananthapuram in Kerala.
- Some of the functions of the board are :
  - Imparting technical advice to those engaged in coconut cultivation and industry.
  - Providing financial and other assistance for the expansion of area under coconut.
  - Recommending measures for improving the marketing of coconut and its products.
  - Fixing grades, specifications and standards for coconut and its products.
  - Collecting statistics on coconut and its products and publishing them.
  - Recommending measures for regulating imports and exports of coconut and its products.

Q 17.B

- As part of the European Green Deal, with the European Climate Law, the European Union (EU) has set itself a binding target of achieving climate neutrality by 2050. This requires current greenhouse gas emission levels to drop substantially in the next decades. As an intermediate step towards climate neutrality, the EU has raised its 2030 climate ambition, committing to cutting emissions by at least 55% by 2030.
- The EU is working on the revision of its climate, energy and transport-related legislation **under the so-called 'Fit for 55 package' in order to align current laws with the 2030 and 2050 ambitions.**
- **'Fit for 55' refers to the at least 55% emission reduction target which the EU has set for 2030. The proposed package aims to bring the EU's climate and energy legislation in line with the 2030 goal. The package was presented by European Commission in July 2021.**
- The package of proposals aims at providing a coherent and balanced framework for reaching the EU's climate objectives that is fair and socially just, maintains and strengthens innovation and competitiveness of EU industry while ensuring a level playing field vis-à-vis third country economic operators and underpins the EU's position as leading the way in the global fight against climate change.
- **Hence, option (b) is the correct answer.**

Q 18.A

- Wetland types found in coastal watersheds include salt marshes, bottomland hardwood swamps, fresh marshes, mangrove swamps, etc.
- **Flood Protection: Coastal wetlands protect upland areas, including valuable residential and commercial property, from flooding due to sea-level rise and storms. Hence option 4 is correct.**
- Coastal wetlands provide habitat for many federally threatened and endangered species**, They act as a habitat for migratory birds and animals. Hence option 1 is correct.**
- Coastal Wetlands can **improve water quality by removing pollutants from surface waters.** Three pollutant removal processes provided by wetlands are particularly important: sediment trapping, nutrient removal, and chemical detoxification. **Hence option 3 is correct.**
- Recharges a **drinking water source, such as a wellhead or source protection area. Reduces levels of contaminants in surface waters that recharge underlying or adjacent groundwaters such as wells. Hence option 4 is correct.**
- Enhances or protects water quality through chemical action, by the removal of nutrients, by the retention or removal of sediments or organic matter, or by moderating the adverse water quality effects of soil erosion or stormwater runoff.

Q 19.D

- **Photochemical smog** is a mixture of pollutants that are formed when **nitrogen oxides and volatile organic compounds (VOCs)** react to sunlight, creating a brown haze above cities. It occurs in warm, dry, and sunny climates. The main components of the photochemical smog result from the action of **sunlight on unsaturated hydrocarbons and nitrogen oxides** produced by automobiles and factories. Photochemical smog has a high concentration of oxidizing agents and is, therefore, called **oxidizing smog.**
- **Formation of Photochemical Smog:**
- When fossil fuels are burnt, a variety of pollutants are emitted into the earth's troposphere including hydrocarbons (unburnt fuels) and nitric oxide (NO). When these pollutants build up to sufficiently high

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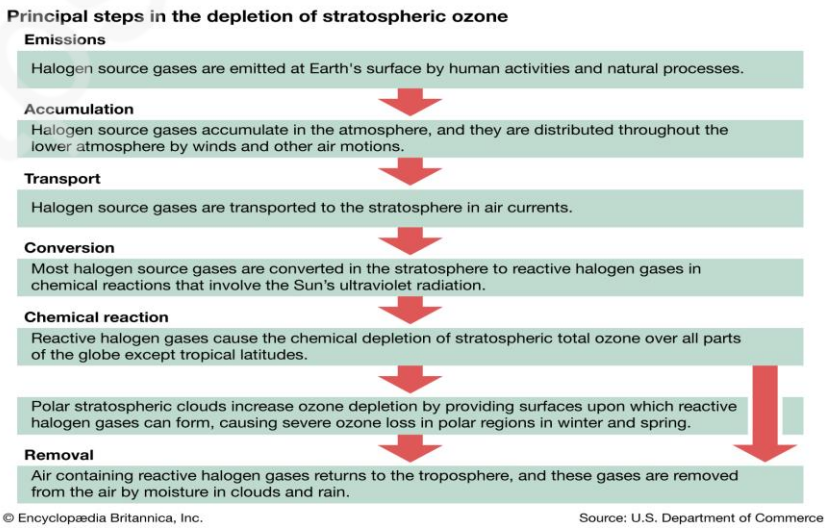
levels, a chain reaction occurs from their interaction with sunlight in which NO is converted into **nitrogen dioxide (NO_2).**

- This **NO_2** in turn absorbs energy from sunlight and breaks it up into nitric oxide and free oxygen atoms.
  - ✓ $NO_2(g) \rightarrow NO(g) + O(g)$
- Oxygen atoms are very reactive and combine with the O_2 in the air to produce **ozone**.
  - ✓ $O(g) + O_2(g) \rightarrow O_3(g)$
- The ozone formed in the above reaction reacts rapidly with the NO to regenerate NO_2. NO_2 is a brown gas and at sufficiently high levels can contribute to haze.
  - ✓ $NO(g)+O(g) \rightarrow NO(g)+O(g)$

- **Ozone is a toxic gas** and both NO_2 and O_3 are strong oxidizing agents and can react with the unburnt hydrocarbons in the polluted air to produce chemicals such as **formaldehyde, acrolein, and peroxyacetyl nitrate (PAN).**
- **Effects of Photochemical Smog:**
- The common components of photochemical smog are **ozone, nitric oxide, acrolein, formaldehyde, and peroxyacetyl nitrate (PAN).** Photochemical smog causes serious health problems. Both ozone and PAN act as powerful eye irritants. Ozone and nitric oxide irritate the nose and throat and their high concentration causes headache, chest pain, dryness of the throat, cough and difficulty in breathing. **Hence option (d) is the correct answer.**

Q 20.D

- **Ozone in the stratosphere** is a product of UV radiations acting on dioxygen (O2) molecules. The UV radiations split apart molecular oxygen into free oxygen (O) atoms. **Ozone is thermodynamically unstable** and decomposes to molecular oxygen. Thus, a dynamic equilibrium exists between the production and decomposition of ozone molecules.
- In recent years, there have been reports of the depletion of this protective ozone layer because of the presence of certain chemicals in the stratosphere. The main reason for ozone layer depletion is the release of **chlorofluorocarbon compounds (CFCs)**, also known as **freons.** These compounds are nonreactive, nonflammable, **nontoxic organic molecules** and therefore used in refrigerators, air conditioners, in the production of plastic foam, and by the electronic industry for cleaning computer parts, etc. Once CFCs are released into the atmosphere, they mix with the normal atmospheric gases and eventually reach the stratosphere. **In the stratosphere, they get broken down by powerful UV radiations, releasing chlorine-free radicals.** The chlorine radicals then react with stratospheric ozone to form chlorine monoxide radicals and molecular oxygen. The reaction of chlorine monoxide radical with atomic oxygen produces more chlorine radicals. The chlorine radicals are continuously regenerated and cause the breakdown of ozone. Thus, **CFCs are transporting agents for continuously generating chlorine radicals into the stratosphere and damaging the ozone layer. Hence statements 1 and 3 are correct.**
- In winter, a special type of cloud called **polar stratospheric cloud** is formed over Antarctica. These polar stratospheric clouds **provide a surface on which chlorine nitrate formed** gets hydrolyzed to form hypochlorous acid. It also reacts with hydrogen chloride produced as per reaction (v) to give molecular chlorine. When sunlight returns to Antarctica in the spring, the sun's warmth breaks up the clouds, and **HOCl and Cl2 are photolyzed by sunlight.** The chlorine radicals thus formed, initiate the chain reaction for **ozone depletion** as described earlier. **Hence statement 2 is correct.**



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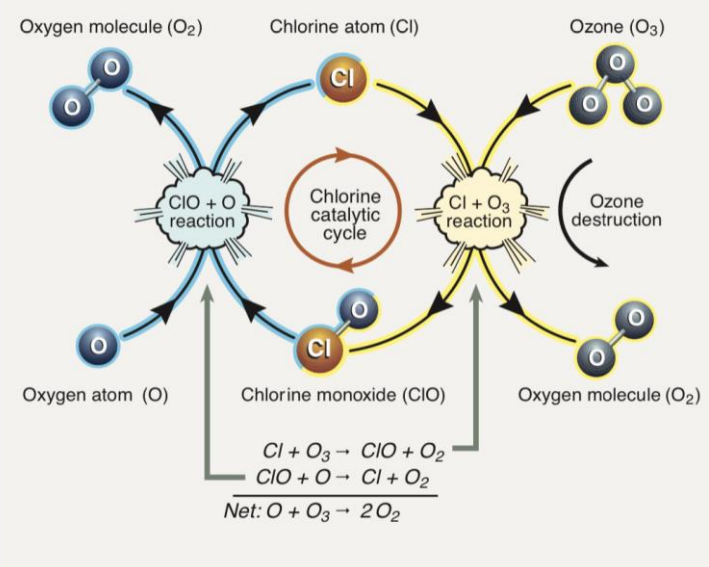

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Q 21.D

- Burning fossil fuels, application of nitrogen-based fertilizers, and other activities can dramatically increase the amount of biologically available nitrogen in an ecosystem. The main sources of nitrogen in the atmosphere therefore include:
  - Atmospheric precipitation,
  - Geological sources,
  - Agricultural land,
  - Livestock (ruminants like cows, sheep, goats etc) and poultry operations and
  - Urban waste
- **Hence option (d) is the correct answer.**

Q 22.A

- **Recently, NTPC Renewable Energy Ltd, a 100% subsidiary of NTPC, has received a go-ahead under 'Ultra Mega Renewable Energy Power Park of the Solar Park Scheme' from the Ministry of New and Renewable Energy to set up a 4750 MW renewable energy park at Rann of Kutch in Khavada, Gujarat. This will be India's largest solar park to be built by the largest power producer of the country.**
- **About Ultra Mega Renewable Energy Power Park of the Solar Park Scheme**
  - The scheme for "Development of Solar Parks and Ultra Mega Solar Power Projects" was rolled out by the Ministry of New & Renewable Energy on 12-12-2014.
  - Under this scheme, it was proposed to set up at least 25 Solar Parks and Ultra Mega Solar Power Projects targeting over 20,000 MW of solar power installed capacity within a span of 5 years starting from 2014-15.
  - The capacity of the Scheme has been enhanced from 20,000 MW to 40,000 MW in 2017.
- NTPC REL also plans to generate green hydrogen on a commercial scale from this park.
- As a part of its green energy portfolio augmentation, NTPC Ltd aims to build 60 GW Renewable Energy Capacity by 2032. Currently, the state-owned power major has an installed capacity of 66 GW across 70 power projects with an additional 18 GW under construction.
- Recently, NTPC has also commissioned India's largest Floating Solar of 10 MW (ac) on the reservoir of Simhadri Thermal Power Plant, Andhra Pradesh.
- **Hence option (a) is the correct answer.**

Q 23.D

- **The greenhouse effect** is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases. Earth is surrounded by a blanket of air called the atmosphere. Greenhouse gas molecules in the atmosphere trap heat as they are transparent to sunlight but not to heat radiation. If the amount of carbon dioxide crosses the delicate proportion of 0.03 percent, the natural greenhouse balance may get disturbed. **Carbon dioxide** is a major contributor to global warming.
- Besides **carbon dioxide, other greenhouse gases are methane, water vapor, nitrous oxide, and ozone. Methane** is produced naturally when vegetation is burnt, digested, or rotted in the absence of

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oxygen. Large amounts of methane are released in paddy fields, coal mines, rotting garbage dumps, and by fossil fuels. **Chlorofluorocarbons (CFCs)** are man-made industrial chemicals used in air conditioning etc. CFCs are also damaging the ozone layer. **Nitrous oxide** occurs naturally in the environment. In recent years, their quantities have increased significantly due to the use of chemical fertilizers and the burning of fossil fuels.

- **Hence option (d) is the correct answer.**

Q 24.A

- **Carbon oxides,** or oxocarbons, are a class of organic compounds containing only carbon and oxygen. The most basic oxocarbons are **carbon monoxide and carbon dioxide.**
- **Carbon monoxide:** Carbon monoxide (CO) is a colorless and odorless gas, highly poisonous to living beings because of its ability to block the delivery of oxygen to organs and tissues. It is produced as a **result of the incomplete combustion of carbon.** CO is poisonous as it binds to hemoglobin to form **carboxyhemoglobin**, which is **about 300 times more stable than the oxygen-hemoglobin complex.** In blood, when the concentration of carboxyhemoglobin reaches about 3–4 percent, the oxygen-carrying capacity of blood is greatly reduced. This **oxygen deficiency** results in headaches, weak eyesight, nervousness, and cardiovascular disorder. In pregnant women who have the habit of smoking the increased CO level in blood may induce premature birth, spontaneous abortions, and deformed babies. **Hence statement 1 is correct.**
- **Carbon dioxide:** Carbon dioxide (CO_2) is released into the atmosphere by respiration, burning of fossil fuels for energy, and by decomposition of limestone during the manufacture of cement. It is also emitted during volcanic eruptions. Normally it forms about **0.03 percent by volume of the atmosphere. Hence statement 2 is not correct.**
- With the increased use of fossil fuels, a large amount of carbon dioxide gets released into the atmosphere. Green plants require CO_2 for photosynthesis and they, in turn, emit oxygen, thus maintaining the delicate balance. Deforestation and the burning of fossil fuels increase the CO_2 level and disturb the balance in the atmosphere. The **increased amount of CO_2** in the air is mainly **responsible for global warming.**

Q 25.C

- Ground level or **tropospheric ozone** is created by chemical reactions between **oxides of nitrogen (NOx gases)** and **volatile organic compounds (VOCs).** Ozone in the troposphere is considered a greenhouse gas and contributes to global warming. It is also a common constituent of Photochemical smog. **Hence statement 1 is correct.**
- The upper stratosphere consists of a considerable amount of ozone (O_3), which protects us from the harmful ultraviolet (UV) radiations coming from the sun. These radiations cause skin cancer (melanoma) in humans. Therefore, it is important to maintain the ozone shield. **Ozone in the stratosphere** is a product of **UV radiations acting on dioxygen (O_2) molecules.** The UV radiations split apart molecular oxygen into free oxygen (O) atoms. These oxygen atoms combine with molecular oxygen to form ozone. **Hence statement 2 is correct.**
- **Ozone is thermodynamically less stable than oxygen** and decomposes into molecular resulting in the liberation of heat. Ozone consists of three molecules of oxygen and is thus in an unstable state. So in order to get stable, it gives up one molecule of oxygen to restore the diatomic state. Thus, a **dynamic equilibrium** exists between the production and decomposition of ozone molecules. In recent years, there have been reports of the depletion of this protective ozone layer because of the presence of certain chemicals in the stratosphere. The main reason for ozone layer depletion is believed to be the release of **chlorofluorocarbon compounds (CFCs)**, also known as freons. **Hence statement 3 is not correct.**

Q 26.A

- Intraspecific interaction in population ecology involves members of the same species interacting with each other. Various types include:
  - **Colonization:**
    - ✓ Colonization is the occupation of habitat or territory by a biological community or of an ecological niche by a single population of a species. Colonial life is exhibited by animals demonstrate shades of mutualism and commensalism.
    - ✓ Colonisation results in collective efforts in gathering food and a greater chance of fertilization during the reproductive phase. **Hence option 2 is correct.**
  - **Aggregation:**
    - ✓ It refers to concentrations of animals in large numbers larger than found in a normal distribution. Aggregation is advantageous due to its group survival value.

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    - ✓ Social life exhibited by tent caterpillars is an example of temporary aggregation. **Hence option 1 is correct.**
  - **Social Organization:**
    - ✓ Termites, ants, bees etc., are highly evolved insects that show division of labour among the individuals in a population is an important mechanism to regulate population density for certain animals.
- **Proto-cooperation** is an interaction between organisms of different species (interspecies) in which both organisms benefit, but neither is dependent on the relationship. **Hence option 3 is not correct.**
- **Symbiosis** is an ecological relationship between two species (interspecies) that live in close proximity to each other. **Hence option 4 is not correct.**

Q 27.A

- There are lot of factors responsible for the depletion of resources:
  - **Overuse or irrational use:** Due to unprecedented increase in human population and the industrial advancement, various natural resources are overused or overexploited.
  - **Non-equitable distribution of resources:** Since natural resources are not distributed equitably across the planet, it led to exploitation of resources at places concentrated with one particular resource, for example coal reserves in Jharkhand and Odisha, petroleum in middle-east countries.
  - **Technological and industrial development:** Due ever expanding technology and industrial revolution, the need of various resources such as coal, minerals etc have increased rapidly which led to increased mining and faster depletion of resources.
  - **Overpopulation:** The population explosion has put a severe strain on the natural resources. Both renewable and non-renewable resources are under pressure. In order to satisfy the ever-increasing demands for food, water, clothing and shelter, man has exploited natural resources to such an extent that it has caused ecological imbalance in nature.
- **Hence option (a) is the correct answer.**

Q 28.A

- **Recently spyware called Pegasus used a zero-day vulnerability in the operating systems (OS) to enter into numerous phones of targeted individuals.**
- **A zero-day vulnerability is a software vulnerability discovered by attackers before the vendor has become aware of it. Because the vendors are unaware, no patch exists for zero-day vulnerabilities, making attacks likely to succeed.**
- Pegasus has evolved from using spear-phishing, a process where an attacker tricks the target to click on a malicious link sent via text message or email, to a more sophisticated method of attack called zero-click attacks. This new form of attack has made the software one of the most dangerous spyware that threatens an individual's privacy.
- A zero-click attack helps spyware like Pegasus to gain control over a device without human interaction or human error.
- A zero-day exploit is a method hackers use to attack systems with a previously unidentified vulnerability.
- A zero-day attack is the use of a zero-day exploit to cause damage to or steal data from a system affected by a vulnerability.
- **Hence, option (a) is the correct answer.**

Q 29.C

- Decomposition is the first stage in the recycling of nutrients that have been used by an organism (plant or animal) to build its body. It is the process whereby the dead tissues break down and are converted into simpler organic forms.
- The rate of decomposition is regulated by climatic factors like temperature and soil moisture as well as by the chemical quality of detritus. These factors limit the rate of decomposition through their regulatory effect on the activities of soil microbes.
- **Temperature and Soil moisture:**
  - Organic waste matter decomposes rapidly at high temperatures and moist conditions of humid tropical regions. Within a few weeks or months, complete decomposition occurs. However, low temperature sharply reduces the decomposition rate even if the moisture content of the soil is high. **Hence option 1 is correct and option 2 is not correct.**
- **Chemical quality of the Detritus:**
  - The chemical quality of detritus is determined by the relative proportions of water-soluble substances like sugars, polyphenols, lignin and nitrogen. **Within the same climatic conditions, the**

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decomposition rate is high when detritus is rich in nitrogen and has low amounts of lignin. High quantities of lignin and chitin lower the rate of decomposition. **Hence, option 3 is correct.**

Q 30.B

- **Recently, the Indian Council of Agricultural Research (ICAR) institute has developed an anti-methanogenic feed supplement 'Harit Dhara'.** When given to bovines and sheep, it not only cuts down their methane emissions by 17-20 percent but also results in higher milk production and body weight gain. Harit Dhara acts by decreasing the population of protozoa microbes in the rumen, responsible for hydrogen production and making it available to the archaea for reduction of CO2 to methane.
- Belching cattle, buffaloes, sheep, and goats in India emit an estimated 9.25 million tonnes (mt) to 14.2 mt of methane annually, out of a global total of 90 mt-plus from livestock.
- Methane is produced by animals having rumen, the first of their four stomachs where the plant material they eat – cellulose, fibre, starch and sugars – gets fermented or broken down by microorganisms prior to further digestion and nutrient absorption.
- Fermentation leads to the production of CO2 and hydrogen. These are used as a substrate by archaea – microbes in the rumen with a structure similar to bacteria – to produce methane, which the animals then expel through burping.
- The 2019 Livestock Census showed India's cattle population at 193.46 million, along with 109.85 million buffaloes, 148.88 million goats and 74.26 million sheep. Being largely fed on agricultural residues – wheat/paddy straw and maize, sorghum – ruminants in India tend to produce 50-100% higher methane than their industrialized country counterparts that are given more easily fermentable/digestible concentrates, silages and green fodder.
- **Hence, option (b) is the correct answer.**

Q 31.A

- **Soil leaching refers is the movement of nutrient elements from topsoil through the soil profile.** Leaching causes significant nutrient losses, particularly in humid regions with high precipitation. Leaching is a natural process caused mainly by precipitation, acidification, and nitrogen saturation. Human activity **such as excess watering of the crop in farmland greatly influences some of these factors and the amount of leaching that occurs. Hence statement 2 is correct**
- An integrated soil fertility management aims at maximizing the efficiency of the agronomic use of nutrients and improving crop productivity. This can be achieved through **a process of Alternate Cropping wherein the plant grown of a farm is changed in 2-3 years, with the use of grain and legumes crops, biological nitrogen is fixed in the soils making it more fertile for the next 2-3 years. Hence statement 1 is correct**
- **Earthworms (EWs)** are a major component of soil fauna communities in most ecosystems and comprise a large proportion of macrofauna biomass. Their activity is beneficial because it can enhance soil nutrient cycling through the rapid incorporation of detritus into mineral soils. In addition to this mixing effect, mucus production associated with water excretion in earthworm guts also enhances the activity of other beneficial soil microorganisms. This is followed by the production of organic matter. **They also help to open up the soil by burrowing and make it more receptive to rainfall. Hence statement 3 is correct**

Q 32.D

- Lakes and ponds are divided into three different "zones" which are usually determined by depth and distance from the shoreline.
- **Littoral Zone: The topmost zone near the shore of a lake or pond is the Littoral zone.** This zone is the warmest since it is shallow and can absorb more of the Sun's heat. It sustains a fairly diverse community, which can include several species of algae (like diatoms), rooted and floating aquatic plants, grazing snails, clams, insects, crustaceans fishes, and amphibians. **Hence, statement 1 is correct.**
- **Limnetic Zone:** The near-surface open water surrounded by the littoral zone is the limnetic zone. **The limnetic zone is well-lighted (like the littoral zone) and is dominated by plankton, both phytoplankton and zooplankton.** A variety, of freshwater fish also occupy this zone. **Hence, statement 2 is correct.**
- **Profundal Zone:** The deep-water part of the lake or pond is called the profundal zone. **This zone is much colder and denser than the other zones.** Little light penetrates all the way through the limnetic zone into the profundal zone. The fauna are heterotrophs they eat dead organisms and use oxygen for cellular respiration. **Hence, statement 3 is correct.**

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Q 33.C

- **Biogas refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen**. **Hence statement 1 is not correct.**
- **Biogas is produced by the anaerobic digestion or fermentation of biodegradable materials such as biomass, manure or sewage, municipal waste, green waste and energy crops**. This type of biogas comprises methane and carbon dioxiode. The other type is wood gas which is created by gasification of wood or other biomass.
- Biogas is primarily composed of methane gas, carbon dioxide, and trace amounts of nitrogen, hydrogen, and carbon monoxide. **Hence statement 2 is correct**. Gobar gas is produced from the anaerobic digestion of manure.
- Importance of Biogas:
  - The products of biogas plant, methane gas is used as fuel and liquid humus as natural fertilizer.
  - Biogas can be generated from locally available materials like animal dung, agricultural waste etc.
  - It is a clean fuel.
  - **It has high calorific value. Hence statement 3 is not correct.**

Q 34.D

- **Pair 1 is not correctly matched.** Wastewater including sewage contains many disease-causing pathogens. Polluted water (and not Arsenic) can cause many diseases like **cholera, typhoid, diarrhea, dysentery, polio, and jaundice. Cholera is an acute diarrheal illness caused by infection of the intestine with Vibrio Cholerae bacteria**
- **Pair 2 is not correctly matched.** Pollution by heavy metal **cadmium** caused the **Itai- Itai disease** in Japan.
- **Pair 3 is not correctly matched. Mercury dumped into water** is transformed into **water-soluble methyl mercury by bacterial action.** This methyl mercury accumulates in the fish. **Minamata disease** was caused on a large scale due to the consumption of this methyl mercury-contaminated fish.

Q 35.B

- Wastes can be classified into various categories like biodegradable and non - biodegradable wastes.
- Wastes that can be **degraded or broken down** through microbial activities of fungi and bacteria are called biodegradable wastes. Agricultural wastes, faecal remains, dead plants, **leather shoes/bags**, tin cans falls under this category.
- Wastes which cannot be degraded or broken down through microbial activities are called non-biodegradable wastes. Such wastes include **crude petroleum, plastics, styrofoam products, glasses**, **polymer, synthetic pesticides, radioactive fall out etc.**
  - Styrofoam is a pure solid, hard with limited flexibility. It is used for making disposable cutlery, plastic models, **CD and DVD cases** etc.
- **Hence option (b) is the correct answer.**

Q 36.B

- **The Global Cybersecurity Index (GCI)** is a multi-stakeholder initiative to raise cybersecurity awareness and to measure the commitment of countries to cybersecurity and its wide field of application cutting across industries and sectors.
  - **It is released by the International Telecommunication Union which is a specialized agency of the United Nations responsible for all matters related to information and communication technologies.**
- **India has been ranked 10th in Global Cybersecurity Index (GCI) 2020. In the Asia Pacific region India has been ranked 4th.**
- USA topped the list by securing first position followed by UK and Saudi Arabia together.
- Global Cybersecurity Index ranking is based on five pillars :
  - Legal measures
  - Technical measures
  - Capacity building measures
  - Organizational measures
  - Cooperation
- **Hence, option (b) is the correct answer.**

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Q 37.B

- **Methane** is a gas that is found in small quantities in Earth's atmosphere. Methane is the simplest hydrocarbon, consisting of one carbon atom and four hydrogen atoms. **Methane is a powerful greenhouse gas.** Methane is flammable and is used as fuel worldwide.
- Although the concentration of methane in Earth's atmosphere is small (around 1.8 parts per million), it is an important greenhouse gas because it is such a **potent heat absorber.** Methane is produced naturally when vegetation is burnt, digested, or rotted in the absence of oxygen. Other major natural sources of methane include emissions from wetlands and oceans, and from the digestive processes of termites. Sources related to human activities include **rice production, landfills, raising cattle** and other ruminant animals, and energy generation.
- The **reaction of methane and chlorine atoms** acts as a primary sink of Cl atoms and is a primary source of hydrochloric acid (HCl) in the stratosphere.
  - $CH_4 + Cl \rightarrow CH_3 + HCl$
  - The HCl produced in this reaction leads to **catalytic ozone destruction in the stratosphere.**
- **Biogas** is produced after organic materials (plant and animal products) are broken down by bacteria in an oxygen-free environment, a process called **anaerobic digestion.** Biogas systems use anaerobic digestion to recycle these organic materials, turning them into biogas, which contains both energy (gas), and valuable soil products (liquids and solids). **Biogas contains roughly 50-70 percent methane,** 30-40 percent carbon dioxide, and trace amounts of other gases.
- **Hence option (b) is the correct answer.**

Q 38.A

- The National Board for Wildlife (NBWL) is a **statutory body**, established under **the Wildlife Protection Act, 1972.** It is important to point out that the wildlife act, as originally enacted in 1972, did not provide for the NBWL. It was only through an amendment of the Wildlife Act in 2002 that the NBWL was constituted. It is a 47-member committee. **Hence statement 1 is correct.**
  - **The Prime Minister as Chairperson**. **Hence statement 2 is not correct**.
  - The Minister in charge of Environment, Forest and Climate Change (MoEFCC) as **Vice-Chairperson.**
  - **The standing committee of NBWL** is chaired by the Minister of Environment Forest and Climate Change.
- **Functions of the National Board:**
  - It is the apex advisory body which looks at the implementation of various schemes for wildlife conservation and development of wildlife and forests by such measures as it thinks fit. **It is not entrusted with dealing with matters of environmental pollution**.
  - Framing policies and advising the Central Government and the State Governments on the ways and means of promoting wildlife conservation and effectively controlling poaching and illegal trade of wildlife and its products.
  - Making recommendations on the setting up of and management of national parks, sanctuaries, and other protected areas and on matters relating to the restriction of activities in those areas.
  - Carrying out or causing to be carried but impact assessment of various projects and activities on wildlife or its habitat.
  - Review from time to time, the progress in the field of wildlife conservation in the country and suggesting measures for improvement thereto.
  - Preparing and publishing a status report at least once in two years on wildlife in the country.

Q 39.B

- **Desert locusts** are known for **causing massive destruction of food crops, greenery, and plants.** They reproduce in lakhs and form swarms in search of food. They travel hundreds of miles with their strong wings and legs without taking any break. According to FAO, a one square kilometer swarm of locusts, with about 40 million locusts, can in a day eat as much food as 35,000 people, assuming that each individual consumes 2.3 kg of food per day. **Hence only option 2 is not correct**
- **Praying mantises** prey and eat any living organism they can successfully capture and devour. But insects may be herbivores, neutrals and carnivores form the main diet. They eat beetles, weevils, bugs, moths, butterflies, and various insects available in our crops. **Thus they act as natural pesticides for controlling the various leaf-eating loopers and semi-loopers**, fruit-eating bollworms, leaf folders, and stem borers, bugs including notorious mealybug, weevils like a grey weevil, and beetles like chefer, brown flower beetle, and insect pests like jassids, aphids, hoppers.

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- **Chalcid Wasps** are insects within the superfamily Chalcidoidea, part of the order Hymenoptera. The superfamily contains some 22,500 known species, and an estimated total diversity of more than 500,000 species, meaning the vast majority have yet to be discovered and described. Generally beneficial to humans as a group, **chalcidoids help keep various crop pests under control,** and many species have been imported as biocontrol agents.
- **Soldier beetles** are a common outdoor insect that can be abundant in accidental invaders as either larvae or adults. Soldier beetles are nicknamed leatherwings because of their soft, clothlike wing covers, which when brightly colored are reminiscent of uniforms. The soldier beetle life cycle begins as a larva that hatches from an egg in the fall. **These larvas are predators and will eat the eggs of many garden pests, as well as damaging larvae and soft insect bodies.** They then hibernate in the soil or among fallen leaves until spring.
- **Hence option (b) is the correct answer**

Q 40.C

- Sustainable use of resources means that we use the resources in such a way that meets the demands of the present without compromising the ability of future generations to achieve their own requirements.
- The following measures need to be taken to avoid over-exploitation of resources:
  - Cultivation of land taking adequate care of soil fertility.
  - Development of irrigation facilities with proper water management. Use of water-saving devices such as traditional conservation methods and roof-top-water harvesting should be used.
  - **Use of bio-fertilisers and bio-pesticides in order to have a biological balance. Hence, option 1 is correct.**
  - Judicious use of underground water to avoid steep fall in underground water level.
  - **Use of traditional seeds instead of the high yielding hybrid varieties** to avoid spread of diseases capable of wiping out the entire crops it happened with the Irish potato crop in 1985 and Bengal rice famines in 1942. **Hence, option 2 not is correct.**
  - Avoiding the use of non-degradable material like plastic to prevent problems of waste management. **Hence, option 3 is correct.**

Q 41.C

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. **Hence statement 1 is correct.**
- CITES was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN).
  - CITES entered into force in July 1975. Currently, there are 183 Parties (include countries or regional economic integration organizations).
- **The CITES Secretariat is administered by UNEP** (The United Nations Environment Programme) and is **located in Geneva, Switzerland.**
- CITES is legally binding on the Parties, it does not take the place of national laws. **Hence statement 2 is correct.**
  - It provides a framework to be respected by each Party, which has to adopt its own domestic legislation to ensure that CITES is implemented at the national level.
  - **Appendix I:**
    - ✓ It lists species that are the most endangered among CITES-listed animals and plants.
    - ✓ They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial, for instance for scientific research.
  - **Appendix II:**
    - ✓ It lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.
  - **Appendix III:**
    - ✓ It is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation**.**
    - ✓ International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates.

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Q 42.B

- **Homeostasis is the maintenance of stable equilibrium, especially through bodily part functions.** For example- Cooling your body through sweating processes. Despite the varying external environmental conditions, organisms try to maintain the constancy of their internal environment that tends to upset their homeostasis. **Hence option (b) is the correct answer.**
- **Regulate** some organisms can maintain homeostasis by physiological or sometimes behavioral means which ensures constant body temperature, constant osmotic concentration, etc. for example standing under a shading tree. Mammals and birds are capable of such regulation also known as thermoregulation and osmoregulation. This is the reason for the 'success' of mammals to maintain constant body temperature and thrive whether they live in Antarctica or the Sahara Desert. However, Plants do not have a mechanism of Homeostasis.
- **Aquatic animals change the osmotic concentration of the body fluids with that of the ambient water osmotic concentration.** The organism also migrates temporarily from one habitat which can be stressful to a more hospitable area and return when a stressful period is over for example- In Keoladeo National Park (Bharatpur) in Rajasthan thousands of migratory birds coming from Siberia during the winter season and other extremely cold northern regions. In bacteria, fungi and lower plants have thick-walled spores that help them to survive unfavorable conditions.

Q 43.D

- Carbon Cycle is based on the creation and absorption of carbon dioxide. The carbon cycle functions in the following manner:
  - Green plants manufacture their own food through photosynthesis in the presence of sunlight and chlorophyll and CO2, from the air and water is absorbed by the roots. **During this process CO2, is fixed as starch by plants.**
  - From the plants, carbon moves along the food chain through consumers at different trophic levels. After the death of plants and animals. the carbon present in their bodies is decomposed and absorbed as food by saprophytic bacteria and fungi.
  - When plants die and get buried in the soil, they undergo slow degradation and compaction. This results in the formation of coal and oil containing huge amounts of carbon.
  - **Carbon dioxide is released into the atmosphere through oxidation by various groups of bacteria and fungi.**
  - **During respiration, plants, animals and trees, use atmospheric oxygen and release carbon dioxide back into the atmosphere.**
  - **The burning of carbon-containing fuels results in the release of CO2, in the atmosphere.**
  - Thus, carbon from CO2, taken by green plants from the environment through photosynthesis is returned to the environment through respiration, decomposition and through burning of fuels.

Q 44.D

- Essential conditions for hydroelectric generation:
  - **A mountainous area or an upland region, where water falls from a height. Hence option 1 is correct.**
  - Temperate climate so that there is continuous flow of water and water does not get frozen due to severe cold.
  - **Water should be free of silt and impurities. Hence option 2 is correct.**
  - Flow of streams should be uniform.
  - Artificial reservoirs.
  - **Industrial zones must be located in the close vicinity of the hydro electric project so as to reduce the loss of electricity transmission. Hence option 3 is correct.**

Q 45.D

- The forest cover has a great value for mankind ensuring economic development, preserving environmental quality and maintaining the basic needs of the rural population. The depletion of the forest cover can have serious implications:
  - Soil erosion due to reduction of vegetational cover.
  - **Reduction in the oxygen liberated by plants through photosynthesis.**
  - Habitat destruction of wild animals.
  - Increase in pollution due to burning of wood as fuel and due to reduction in carbon dioxide fixation by plants.
  - Decrease in availability of forest products
  - Loss of cultural diversity
  - **Loss of biodiversity.**

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- **Lowering of the water table due to more run-off and thereby increased use of the underground water leading to increased frequency of droughts.**
- Scarcity of forest products and deterioration in economy of people residing near forests.
- Rise in carbon dioxide level results in increased thermal level of earth which in turn results in melting of ice caps and glaciers and consequent flooding of coastal areas.
- **Hence, option (d) is the correct answer.**

Q 46.C

- **Coral reefs** are often called the **"rainforests of the sea"** for their astounding richness of life. Due to their structural complexity, corals are one of the most productive ecosystems on Earth, providing important services to mankind including fisheries, coastal protection, medicines, recreation, and tourism.
- Corals are tiny animals that live in colonies and derive nourishment and energy from a symbiotic relationship with zooxanthellae algae. Coral reefs are formed over the course of thousands of years as limestone skeletons constructed by corals accumulate and form a structural base for living corals. Scientists estimate reefs provide a home for millions of species - from brightly colored tropical fish to sea cucumbers which produce anti-cancer compounds. The formation of highly consolidated reefs only occurs where the temperature does not fall below 18°C for extended periods of time. The water must also be clear to permit high light penetration. The corals' requirement for high light also explains why most reef-building species are restricted to the euphotic (light penetration) zone, approximately 70 m. In light of such stringent environmental restrictions, reefs generally are confined to tropical and semitropical waters.
- The diversity of reef corals, i.e., the number of species, decreases in higher latitudes up to about 25° north and south, beyond which reef corals are usually not found. Bermuda, at 32° north latitude, is an exception to this rule because it lies directly in the path of the Gulf Stream's warming waters.
- **Hence option (c) is the correct answer**

Q 47.C

- **Option 1 is correct. A Sanitary landfill** is a way of disposing of refuse on land without creating a nuisance to public health. Here the waste is dumped in a site and covered with earth to prevent rodents or insects from entering into it. The waste is then subjected to bacterial decomposition.
- **Option 2 is not correct.** An increase **in the use of pesticides** is harmful to the soil and leads to soil pollution. Instead, biological methods of pest control can be used to decrease the need for pesticides.
- **Option 3 is correct. Composting waste** is an **aerobic method of decomposing solid wastes**. It involves the decomposition of waste into humus called compost which acts as a good fertilizer for plants. The microorganisms help to stabilize the organic matter. Example Fungi starts working in the first week after dumping the material. Actinomycetes help in the last stages of the breakdown. Bacteria is present all throughout the process. It involves the decomposition of waste into humus called compost which acts as a good fertilizer for plants.

Q 48.C

- **Standing State:** It is the amount of inorganic nutrients found in an ecosystem such as carbon, nitrogen, phosphorus, calcium, etc. **Hence, option (c) is the correct answer.**
- It represents the part of non-living matter.
- It varies in different kinds of ecosystems and also on a seasonal basis.
- It usually occurs in the growth medium of producers. It determines the productivity of the ecosystem.
- It circulates between living and non-living components of the ecosystem.
- It is being regularly depleted and replenished by the living matters.
- **Standing crop** is the amount of biomass present in an ecosystem. It represents the entire living matter.

Q 49.D

- Desert plants have had to develop different ways of capturing water in order to survive in their habitat. These changes are called adaptation.
- A common adaptation to store water in the roots, stems, leaves or fruit. Plants that store water in this way are called succulents, one of which is the cactus.
- Some plants have developed very long roots that go deep into the ground to reach underground water. Others have developed spreading root systems lying just below the surface and stretching widely. This gives the plant many tiny roots that capture water when it rains. **Hence option 2 is correct.**
- Another desert adaptation is seen in the leaves. Desert plants limit water loss through their surface leaves by the size or texture of their leaves.
- Small or spiny leaves limit the surface area exposed to the drying heat. Glossy leaves reflect the sun's rays, reducing leaf temperatures. Waxy leaves prevent moisture from escaping. **Hence option 1 is correct.**

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- In order to survive, desert animals have developed a number of ways of adapting to their habitat. The most common adaptation in behaviour is staying in the shade of plants or rocks or by burrowing underground in the heat of the day. Many desert animals are nocturnal i.e., they stay inactive in shelter during the day and hunt at night when it is cool.
- Fat increases body heat, so some desert animals have concentrated the body's fat in one place, such as a hump or tail, rather than having it all through the body. **Hence option 3 is correct.**
- **The absence of sweat glands and the concentration of urine are other physical adaptations made by desert animals. Hence, statement 4 is not correct.**

Q 50.D

- Pugmark is the term used to refer to the footprint of most animals. These are the marks which are left by different animal species while they are walking, running, or moving from one place to another place. Pugmark of every individual animal species is distinct it is used for identification purposes. They are used for-
  - Tracking of animals (especially large cats).
  - To make an accurate identification of the presence of different species
  - accurate determination of sex
  - Accurate identification of age and physical condition of an animal.
- **Hence option (d) is the correct answer.**

Q 51.D

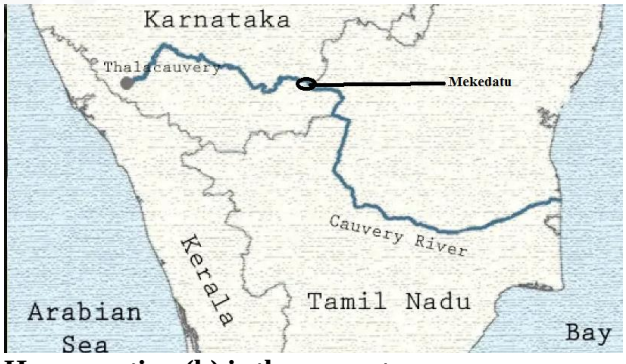
- **Genetic diversity refers to the diversity (or genetic variability) within a single species.** Each individual species possesses genes that are the source of its own unique features: In human beings, for example, the huge variety of people's faces reflects each person's genetic individuality. The term genetic diversity also covers distinct populations of a single species, such as the thousands of breeds of different dogs or the numerous variety of roses. **Hence statement 1 is not correct.**
- Human beings genetically belong to the homo sapiens group and also differ in their characteristics such as height, colour, physical appearance, etc., considerably. This is due to genetic diversity
- The huge variety of different gene sets define an individual or a whole population's ability to tolerate stress from any given environmental factor. Genetic Diversity is also important with respect to the adaptability of species to varied environments with special reference to changing climatic conditions. So higher is the Genetic diversity greater are the chances of adapting to the Environmental changes and thus more confirmed is the survival of the species. **Hence statement 2 is not correct.**

Q 52.D

- Eutrophication is a process of **depletion of oxygen** from waterbodies occurring either naturally or due to human activities.
- The process of eutrophication takes place due to introduction of nutrients and chemicals through **discharge of domestic sewage, industrial effluents and fertilizers from agricultural field**.
- The excessive growth (or bloom) of algae and plankton in a water body are indicators of this process.
- **Hence option (d) is the correct answer.**

Q 53.B

- **The Mekedatu reservoir project is proposed to be built at a deep gorge situated at the confluence of the Cauvery river and its tributary Arkavathi, at Ontigondlu in Karnataka's Ramanagara district.**
- The reservoir would have a capacity of around 67,000 million cubic feet of water and is aimed at ensuring drinking water to Bengaluru and neighbouring areas. The project is also envisioned to generate 400 MW power once it is completed.
- The Mekedatu project is one issue in the Cauvery water sharing dispute, which has been a bone of contention between the two states of Tamilnadu and Karnataka.



- **Hence, option (b) is the correct answer.**

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Q 54.A

- Under MoEFCC, the Central Pollution Control Board (CPCB) is a **statutory** organization, constituted in September 1974 under **the Water (Prevention and Control of Pollution) Act, 1974**. Further, CPCB was entrusted with the powers and functions under **the Air (Prevention and Control of Pollution) Act, 1981**.
- **Principal Functions of the CPCB, as spelt out in the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981. The CPCB has a central office as well as a network of zonal offices.**
  - The zonal offices of CPCB are **not called State Pollution Control Boards** (SPCBs).
  - The SPCBs was established by the States, following the State Legislatures' adoption of the Water Act of 1974 and then the Air Act of 1981. **Hence statement 2 is not correct.**
- **It has wide-ranging powers and responsibilities to:**
  - **advise the Central Government** on any matter related to prevention and control of water and air pollution and improvement of air quality;
  - plan nationwide programs for the prevention, control, and abatement of water and air pollution;
  - coordinate the activities of SPCBs and resolve disputes among them, etc
  - **Hence statement 1 is correct.**

Q 55.A

- Recently the Uttar Pradesh State Law Commission has released a draft Bill on population control. Titled "The Uttar Pradesh Population (Control, Stabilisation and Welfare) Bill, 2021.
- The total fertility rate of Uttar Pradesh has been declining but is still higher than the replacement fertility rate of 2.1.
- As per census 2011, the top states in terms of population are:

Rank	States	2011 Census	2021 estimates
1	Uttar Pradesh	19,98,12,341	23 Crores
2	Maharashtra	11,23,74,333	12.44 Crores
3	Bihar	10,40,99,452	12.30 Crores
4	West Bengal	9,12,76,115	9.8 Crores
5	Madhya Pradesh	7,26,26,809	8.45 Crores
6	Tamil Nadu	7,21,47,030	7.65 Crores
7	Rajasthan	6,85,48,437	8 Crores
8	Karnataka	6,10,95,297	6.70 Crores
9	Gujarat	6,04,39,692	7 Crores
10	Andhra Pradesh	4,95,76,777	5.27 Crores

- **Hence, option (a) is the correct answer.**

Q 56.B

- **Wildlife (Protection) Act, 1972: The Act was enacted for the protection of plants and animal species. Hence statement 3 is correct.**
  - The primary purpose of enacting this was to maintain ecological processes and life-supporting systems to preserve biodiversity and to ensure continuous use of species i.e., protection and conservation of wildlife.
  - Prior to this legislation, India had only five designated national parks.
    - ✓ At present, there are 104 existing national parks in India covering an area of 43,716 km2, which is 1.33% of the geographical area of the country (National Wildlife Database, Dec. 2020).
- **Salient Features of the Act:**
  - **It prohibits the hunting of any wild animal specified in Schedules I, II, III, and IV of the act.**
    - ✓ A wild animal listed under these schedules can be hunted/ killed only after getting permission from the Chief Wildlife Warden (CWLW) of the state if:
      - It becomes dangerous to human life or to property (including standing crops on any land).
      - It is disabled or suffering from a disease that is beyond recovery.
  - **It prohibits the uprooting, damage, collection, possession, or selling of any specified plant from any forest land or any protected area.**

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- ✓ The CWLW, however, may grant permission for uprooting or collecting a specific plant for the purpose of education, scientific research, preservation in a herbarium, or if a person/institution is approved to do so by the central government.

- **The State Government** can constitute any area as a Sanctuary, provided the area is of adequate ecological, faunal, floral, geomorphological, natural, or zoological significance.
  - ✓ The State government can also declare an area (including an area within a sanctuary) as a National Park.
- **Power of Central Government to declare areas as sanctuaries or National Parks:**
  - ✓ Where the State Government leases or otherwise transfers any area under its control, not being an area within a sanctuary, to the Central Government, the Central Government may, if it is satisfied that the conditions specified in section 18 of Wildlife Protection Act, 1972 are fulfilled in relation to the area so transferred to it, declare such area, by notification, to be a sanctuary or National Park.
- It provides for the development of selected Ex-situ conservation areas like Zoological and Botanical Gardens. **Hence statement 2 is not correct.**
- **Constitution of Various Bodies:**
  - ✓ It provides for the constitution of bodies to be established under this act such as the National and State Board for Wildlife, Central Zoo Authority, and National Tiger Conservation Authority.
- **Authorities Appointed under the Act:**
  - ✓ The Central Government appoints the **Director of Wildlife Preservation** and **assistant directors** and other officers subordinate to the Director.
  - ✓ The **State Governments** appoint **a Chief Wildlife Warden (CWLW)** who heads the Wildlife Wing of the department and exercises complete administrative control over Protected Areas (PAs) within a state. **Hence statement 1 is not correct.**
    - The state governments are also entitled to appoint Wildlife Wardens in each district.

Q 57.A

- As water is an excellent solvent, water-soluble inorganic chemicals that include heavy metals such as cadmium, mercury, nickel, etc constitute an important class of pollutants. All these metals are dangerous to humans because our bodies cannot excrete them. Over time, it crosses the tolerance limit. These metals then can damage kidneys, central nervous system, liver, etc.
- **Fluoride:** Fluoride: For drinking purposes, water should be tested for fluoride ion concentration. Its **deficiency in drinking water** is harmful to man and causes diseases such as **tooth decay** etc. Soluble fluoride is often added to drinking water to bring its concentration up to 1 ppm. At the same time, excess fluoride (over 10 ppm) causes harmful effects to bones and teeth, as reported from some parts of Rajasthan. **Hence statement 2 is correct.**
- **Lead:** Drinking water gets contaminated with lead when lead pipes are used for the transportation of water. The prescribed upper limit concentration of lead in drinking water is about 50 ppb. **Lead can damage the kidney, liver,** reproductive system, etc. **Hence statement 3 is correct.**
- **Sulfate:** Excessive sulfate (>500 ppm) in drinking water causes the laxative effect, otherwise at moderate levels it is harmless.
- **Nitrate:** The maximum limit of nitrate in drinking water is 50 ppm. Excess nitrate in drinking water can cause diseases such as methemoglobinemia **('blue baby' syndrome). Hence statement 1 is not correct.**

Q 58.C

- International Union for Conservation of Nature (IUCN) is a membership Union composed of both government and civil society organisations.
- **Established in 1948**, It has become global authority on the status of the natural world and the measures needed to safeguard it.
- It is headquartered in **Switzerland.**
- In 1964, IUCN established the IUCN Red List of Threatened Species, which has since evolved into the world's most comprehensive data source on the global extinction risk of species.
- IUCN also played a fundamental role in the creation of key international conventions, including the Ramsar Convention on Wetlands (1971), the World Heritage Convention (1972), the Convention on International Trade in Endangered Species, (1974) and the Convention on Biological Diversity (1992).
- The IUCN Red List of Threatened Species, is the world's most comprehensive inventory of the global conservation status of plant and animal species.
  - It uses a set of quantitative criteria to evaluate the extinction risk of species. These criteria are relevant to most species and all regions of the world.

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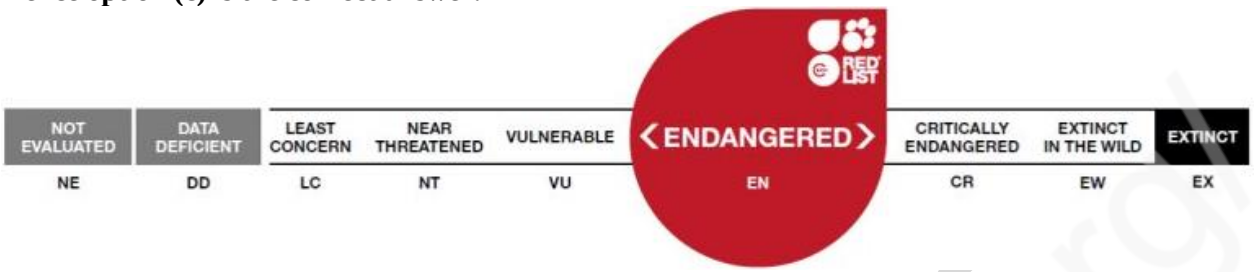
- The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct). Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) species are considered to be threatened with extinction.
- It is recognized as the most authoritative guide to the status of biological diversity.
- It is also a key indicator for the SDGs and Aichi Targets.

- **Hence option (c) is the correct answer.**



Q 59.C

- Ecology is the study of the interactions between organisms and their environment. A number of concepts have been proposed by different ecologists to explain such interactions such as:
  - **Allen's rule**
    - ✓ In endothermic animals from cold climates tend to have shorter ears, tail & leg in colder parts than in the warmer parts; thus reducing their surface to volume ratio. **Hence, option (c) is the correct answer.**
  - **Bergman's rule**
    - ✓ It explains the effect of temperature on the absolute size of an animal. The birds & mammals of colder areas are larger in size as compared to their equivalents in a warmer area, again to reduce their surface area to volume ratio.
    - ✓ Polar bears, for example, are much larger than bears which live closer to the equator.
  - **Gause's Hypothesis/ Exclusion Principle**
    - ✓ It states that if two species have almost completely overlapping niches they cannot continue to coexist. One of the two species will outcompete the other and persist. The other will go locally extinct.
  - **Gloger's rule**
    - ✓ In warm, humid climates animals bear dark pigmentation than those found in cool & dry climates.
    - ✓ It explains the formation of narrow wings in colder regions & boarder wings in warmer regions.
  - **Jordon's rule**
    - ✓ Fishes inhabiting water of low temperature tend to have more vertebrae than those of warmer water.
    - ✓ Fish size, as well as the number of vertebrae, increase in colder areas compared to warmer areas.
  - **Lindeman's Law of Trophic Efficiency**
    - ✓ While transferring organic food from one trophic level to the next about 10% of the organic matter is stored as flesh, the remaining is lost during transfer or broken down in respiration.

Q 60.B

- **Recently, National Tiger Conservation Authority has set up a special committee to assess the feasibility of declaring Kumbhalgarh Wildlife Sanctuary a Tiger Reserve. Hence, statement 1 is not correct.**
- **Kumbhalgarh Wildlife Sanctuary is located in the Rajsamand District of Rajasthan State.** It surrounds the Kumbhalgarh fortress and it extends across the Aravalli Range, covering parts of the Rajsamand, Udaipur, and Pali districts. **Hence, statement 2 is correct.**
- This sanctuary is known for being the home to a variety of animals including some endangered species. Animals like sambhar, nilgai, chausingha (the four-horned antelope), chinkara, etc roam this sanctuary.
- The tiger reserves of India were set up in 1973 and are governed by Project Tiger, which is administrated by the National Tiger Conservation Authority.
- **Uttarakhand's Corbett Tiger Reserve (CTR) has reported the highest tiger density among India's 50 reserves with 14 tigers per 100 sq km, followed by Kaziranga, Nagarhole and Orang tiger reserves, according to the 'Status of Tigers Co-predators and Prey in India' Report.**

Q 61.B

- **In July 2021, NASA (National Aeronautics and Space Administration) has announced that its new spacecraft, named Near-Earth Asteroid Scout or NEA Scout, has completed all required tests and is ready for launch.**

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- NEA Scout is one of the several payloads that will hitch a ride on Artemis I, which is expected to be launched in November 2021.
  - Artemis I is an uncrewed test flight of the Orion spacecraft and Space Launch System rocket. Under the Artemis programme, NASA aims to land the first woman on the Moon in 2024 and also establish sustainable lunar exploration programs by 2030.
- NEA Scout is a miniaturized spacecraft, known as a CubeSat, developed under NASA's Advanced Exploration Systems Program.
  - CubeSats are miniaturized spacecraft with great potential for space-based science, exploration, engineering support, Earth observation, and relay communication.
  - In addition to their efficiency, low cost, and compatibility with larger payloads, CubeSats also offer opportunities for increased science return and operational support of larger missions.
- **Its main mission is to fly by and collect data from a near-Earth asteroid. It will also be America's first interplanetary mission using special solar sail propulsion.**
- Near-Earth asteroids are important destinations for exploration, in situ resource utilization—harnessing resources at the exploration site—and scientific research in deep space. Some near-Earth asteroids are also potentially hazardous to Earth, so understanding their properties could help to develop effective strategies for reducing the potential damage they may cause in the event of an impact.
- Detections of near-Earth asteroids have steadily risen in the past decade and are expected to grow, offering expanded opportunities as exploration destinations.
- **Hence, option (b) is the correct answer.**

Q 62.B

- **The proposed Lemru Elephant Reserve in Chhattisgarh has been in news recently due to its reduced size from around 1995 sq km initially to 450 sq km.**
- Lemru Elephant reserve is proposed to prevent human-animal conflict in the Korba region of Chhattisgarh as elephants regularly move from Jharkhand and Odisha to Chhattisgarh.
- The area proposed under this reserve is part of the Hasdeo Aranya forests, a very diverse biozone that is also rich in coal deposits.
- **Hence, option (b) is the correct answer.**

Q 63.B

- **Recently Union government has merged the Department of Public Enterprises (DPE) with the Finance Ministry to give it a better control over key state-owned firms, review their capital expenditure plans and chalk out measures relating to revival as well as closure of CPSEs.**
- Ministry of Heavy Industries and Public Enterprises, the parent ministry of Department of Public Enterprises (DPE), will now be called the Ministry of Heavy Industries.
- The other important departments under the Ministry of Finance are
  - Department of Expenditure
  - Department of Revenue
  - Department of Financial Services
  - **Department of Investment and Public Asset Management**
  - Department of Economic Affairs
- **Department for Promotion of Industry and Internal Trade is a department under the Ministry of Commerce and Industry.**
- **Hence, option (b) is the correct answer.**

Q 64.B

- **Biomagnification** is the accumulation of a chemical by an organism from water and food exposure that results in a concentration that is greater than would have resulted from water exposure only and thus greater than expected from equilibrium. **Hence option (b) is the correct answer.**
- In simple terms, **it means an increase in the concentration of toxic substances along the food chain. Bioaccumulation** is the phenomenon of concentrated toxic deposition at the highest level of the food chain. Toxic substances at the level of the primary producers get concentrated at each trophic level as they move up the food chain.

Q 65.C

- The sanitary landfill is a way of disposing refuse on land without creating nuisances or hazards to public health or safety. This system of disposing waste is essentially a **biological** method. The waste undergoes following five phases:

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- During the first phase of operation, **aerobic bacteria deplete the available oxygen** and as a result the temperature decreases.
- In the second phase, **anaerobic conditions become established** and hydrogen and carbon dioxide are evolved.
- Phase three establishes population of bacteria and the **beginning of methanogenic activity.**
- In the fourth phase the **methanogenic activity becomes stabilised.**
- The fifth phase **depletes the organic matter** and the system returns to aerobic state.

- **Hence option (c) is the correct answer.**

Q 66.C

- Organisms in the ecosystem are related to each other through feeding mechanisms or trophic levels, i.e. one organism becomes food for the other. A sequence of organisms that feed on one another, form a food chain.
- Energy is the basic force responsible for all metabolic activities. **The flow of energy from producer to top consumers is called energy flow which is unidirectional. Hence, statement 1 is correct.**
- The transfer of food energy from its source in plants through a series of organisms with repeated eating and being eaten is referred to as a food chain. **At each transfer a lot of energy (80-90%) from food is lost as heat. Hence, only the remaining 10-20% is transferred to the next trophic level. Hence, statement 2 is not correct.**
- Thus, each trophic level contains less energy than the preceding level. For example, deer (herbivores) are more abundant than tigers {carnivores). Therefore, the number of steps in any food chain is limited to four or five. **The nearer the organism is to the beginning of the food chain, the greater is the available energy. And higher the trophic level, the lesser the energy available. Hence, statement 3 is not correct.**

Q 67.A

- **Eutrophication** is the process in which a water body becomes overly **enriched with nutrients,** leading to the plentiful growth of simple plant life. The **excessive growth (or bloom) of algae** and plankton in a water body are indicators of this process. Eutrophication is considered to be a serious environmental concern since it often results in the **deterioration of water quality** and the **depletion of dissolved oxygen** in water bodies. Eutrophic waters can eventually become "**dead zones**" that are incapable of supporting life.
- **Chemical pollutants in water and Eutrophication process:**
  - As water is an excellent solvent, water-soluble **inorganic chemicals** that include heavy metals such as cadmium, mercury, nickel, etc constitute an important class of pollutants. Organic **chemicals** are another group of substances that are found in polluted water. Petroleum products pollute many sources of water e.g., major oil spills in oceans. Other organic substances with serious impacts are the pesticides that drift down from sprays or runoff from lands. Various industrial chemicals like **polychlorinated biphenyls, (PCBs)** which are used as cleaning solvents, detergents, and fertilizers add to the list of water pollutants. PCBs are suspected to be **carcinogenic**.
  - Nowadays most of the **detergents** available are biodegradable. However, their use can create other problems. The bacteria are responsible for degrading biodegradable detergent feed on it and grow rapidly. While growing, they may **use up all the oxygen dissolved in water.** The lack of oxygen kills all other forms of aquatic life such as fish and plants. Fertilizers contain phosphates as additives. The addition of phosphates in water enhances algae growth. Such **profuse growth of algae** covers the water surface and reduces the oxygen concentration in water. This leads to anaerobic conditions, commonly with the accumulation of obnoxious decay and animal death. Thus, bloom-infested water inhibits the growth of other living organisms in the water body. This process in which **nutrient-enriched water bodies** support a dense plant population, which kills animal life by depriving it of oxygen and results in **subsequent loss of biodiversity is known as Eutrophication.**
  - **Hence option (a) is the correct answer.**

Q 68.C

- The Animal Welfare Board of India is a statutory advisory body on Animal Welfare Laws and promotes animal welfare in the country. The Animal Welfare Board of India, headquartered at Ballabhgarh in Haryana state, is a statutory advisory body advising the Government of India's Ministry of Fisheries, Animal Husbandry, and Dairying. It was previously based in Chennai.
- **It was established in 1962 under Section 4 of the Prevention of Cruelty to Animals Act, 1960.**
- It was started under the stewardship of **Late Smt. Rukmini Devi Arundale**, well known humanitarian. From ensuring that animal welfare laws in the country are diligently followed, to provide grants to Animal

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Welfare Organizations and advising the Government of India on animal welfare issues, the Board has been the face of the animal welfare movement in the country for the last 50 years.

- The Board consists of 28 Members. The term of office of Members is for a period of 3 years.
- **The Prevention of Cruelty to Animals Act, 1960:**
  - It is to prevent the infliction of unnecessary pain or suffering on animals.
  - It provides for punishment for causing unnecessary cruelty and suffering to animals.
  - It defines animals and different forms of animals.
  - It discusses different forms of cruelty, exceptions, and the killing of a suffering animal in case any cruelty has been committed against it, so as to relieve it from further suffering.
  - It provides the guidelines relating to experimentation on animals for scientific purposes.
  - It enshrines the provisions relating to the exhibition of the performing animals, and offenses committed against the performing animals.
  - It provides for the limitation period of 3 months beyond which no prosecution shall lie for any offenses under this Act.
- **Hence option (c) is the correct answer.**

Q 69.C

- **Mahananda Bachao Committee has recently filed a case at the National Green Tribunal with regard to the Mahananda river pollution**.
  - Rapid urbanization and a lack of space to dispose of waste have led the Mahananda river to be treated as a dumpsite.
  - Rampant encroachment along the river bed and illegal sale of land has further infringed the quality of the river.
- **Mahananda River is a transboundary river that flows through the Indian states of Bihar and West Bengal. It is an important tributary of the river Ganga**.
- **It is spread over districts of Purnea, Kishanganj, Araria and Katihar in Bihar and Malda, West Dinajpur and Darjeeling in West Bengal.**
- The Mahananda originates from the Paglajhora falls near Kurseong in West Bengal's Darjeeling district. The water — clean and pristine during origin — turns filthy and polluted as it enters Siliguri in Champasari.
- Mahananda River merges into the Ganga at Godagari Ghat in Bangladesh after flowing for 360 kilometres.
- The main tributaries of the Mahananda river are Balason, Mechi, Kankai.
- **Hence, option (c) is the correct answer.**

Q 70.D

- Desertification is the reduction or destruction of the biological potential of the land, leading to desert like conditions.
- **Lack of vegetative cover, wind and water erosion, overgrazing, slash and burn agriculture cause desertification.**
- Meaningful agricultural activities are not possible on desert land. Desertification causes land degradation, making the soil infertile.
- **Hence option (d) is the correct answer.**

Q 71.D

- The purpose of the Indian Forest Act,1927 was the protection and conservation of forests and judicial use of forest products. It aimed to **regulate the movement of forest produce, and duty leviable forest produce**. **Hence statement 1 is correct.**
  - It also explains the procedure to be followed for declaring an area as Reserved Forest, Protected Forest or a Village Forest. **Hence statement 2 is correct.**
    - ✓ **Reserved Forests:** Reserve forests are the most restricted forests and are constituted by the State Government on any forest land or wasteland which is the property of the Government. In reserved forests, local people are prohibited, unless specifically allowed by a Forest Officer in the course of the settlement.
    - ✓ **Protected Forests**: The State Government is empowered to constitute any land other than reserved forests as protected forests over which the Government has proprietary rights and the power to issue rules regarding the use of such forests. This power has been used to establish State control over trees, whose timber, fruit or other non-wood products have revenue-raising potential.

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- ✓ **Village forest**: Village forests are the one in which the State Government may assign to any village community the rights of Government to or over any land which has been constituted a reserved forest. **Hence statement 3 is correct.**
- The State Government may declare **a tree or trees in** a protected forest as **reserved.**
- The State Government may prohibit the quarrying of stone or the burning of lime or charcoal or collection or **removal of any forest produce in any forest**.

Q 72.D

- Toxic particulate materials are those material which **contaminate food and water supply** posing a severe threat to public health.
  - **Lead** is a harmful toxin and it can affect the development of a child's brain.
  - **Asbestos** can cause a respiratory disease known as asbestosis, as well as chest and lung cancer.
  - **Mercury** is a highly toxic chemical which attacks the nervous system, causing brain damage and ever death.
  - **Nickel** can cause respiratory symptoms and lung cancer.
  - **Cadmium** can cause cardiovascular diseases and hypertension.
  - **Arsenic** is another toxic chemical that has been shown to cause cancer.
- **Hence option (d) is the correct answer.**

Q 73.C

- **Acid rain, or acid deposition**, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. Normally rainwater has a pH of 5.6 due to the presence of H+ ions formed by the reaction of rainwater with carbon dioxide present in the atmosphere. When the **pH of the rainwater drops below 5.6, it is called acid rain. Hence option (c) is the correct answer.**
- Acid rain refers to the ways in which acid from the atmosphere is deposited on the earth's surface. **Oxides of nitrogen and sulfur** which are acidic in nature can be blown by the wind along with solid particles in the atmosphere and finally settle down either on the ground as dry deposition or in water, fog and snow as wet deposition.
- Acid rain is a byproduct of a variety of human activities that emit the oxides of sulfur and nitrogen in the atmosphere. As mentioned earlier, the **burning of fossil fuels** (which contain sulfur and nitrogenous matter) such as **coal and oil in power stations** and furnaces or petrol and diesel in motor engines produce sulfur dioxide and nitrogen oxides. **SO2 and NO2 after oxidation and reaction with water** are major contributors to acid rain because polluted air usually contains particulate matter that catalyzes the oxidation.
- **Ammonium salts** are also formed and can be seen as an atmospheric haze (aerosol of fine particles). Aerosol particles of oxides or ammonium salts in raindrops result in **wet deposition**. SO2 is also absorbed directly on both solid and liquid ground surfaces and is thus deposited as **dry deposition.**
- **Acid rain is harmful to agriculture**, trees, and plants as it **dissolves and washes away nutrients needed for their growth.** It causes respiratory ailments in human beings and animals. When acid rain falls and flows as groundwater reaches rivers, lakes, etc. it affects plants and animal life in the aquatic ecosystem. It **corrodes water pipes resulting in the leaching of heavy metals** such as iron, lead, and copper into the drinking water.

Q 74.D

- India has huge potential for wind energy generation. Large areas having annual average wind speeds in excess of 20 km per hour are available in **Tamil Nadu, Andhra Pradesh, Kerala and Karnataka and the coastal states of Gujarat and Maharashtra.**
- Wind energy has also been utilized by Indian technologists through the creation of small water pumping wind mills called Samira, which can be used as effective rural technology to lift water from shallow wells, irrigation through pumps, heating of water etc.
- **Hence option (d) is the correct answer.**

Q 75.A

- Norman Myers in 1988 has put forth the concept of Biodiversity Hotspot. A region is declared as a biodiversity hotspot region when two strict criteria are met: **Species endemism** - it must contain at least 1,500 species of vascular plants as endemics which is to say that it must have a high percentage of plant life found nowhere else on the planet.
- **Degree of threat** - it has to have lost at least 70% of its original habitat which means, it must be threatened.

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- **Statement 1 is correct:** Each biodiversity hot spot represents a remarkable universe of extraordinary endemicity of both plants and animals species struggling to survive in rapidly shrinking ecosystems. More than 50% of the world's plant species and 42% of all terrestrial animal species are endemic to the 36 biodiversity hot spots.
- **Statement 2 is not correct: Conservation International** has been working for over 30 years to protect biodiversity hotspots through cutting-edge science, innovative policy, and global reach. It also empowers people to protect the nature that the world relies on for food, freshwater, and livelihoods.

Q 76.C

- **Abiotic** or non-living and **biotic** or living are two components of the ecosystem. They are the same for both the ecosystem and the environment. These factors determine the survival of an organism and one single factor can limit the range of an organism.
- Abiotic factors include- Energy, Radiation, Temperature & heat flow, Water, Frost Atmospheric gases and wind, Fire, Gravity, Topography, Soil, Geologic substratum, etc.
- Impact of Frost on plant growth:
  - It results in freezing the soil moisture.
  - **There is an increasing concentration of salts and dehydration of cells** because Water in the intercellular spaces of the plant gets frozen into ice. **Hence statement 1 is correct.**
  - **It leads to the formation of canker disease. (Bacteria, fungi, and viruses are the reason behind other diseases having similar symptoms). Hence statement 2 is correct.**

Q 77.D

- Based on the particular kind of habitat, the natural ecosystems are further categorised into terrestrial and aquatic. Aquatic ecosystems can be either freshwater (ponds, lakes, streams), or saltwater (marine, estuaries) types.
- Freshwater ecosystems can be divided into two categories:
  - A lentic ecosystem entails a body of standing water, ranging from ditches, seeps, ponds, seasonal pools, **basin marshes, swamps** and lakes. Deeper waters, such as lakes, may have layers of ecosystems, influenced by light. Ponds, due to their having more light penetration, are able to support a diverse range of water plants. There are also known as the Pond ecosystem. **Hence, options 2 and 3 are not correct.**
  - A lotic ecosystem can be any kind of moving water, such as a run, creek, brook, river, **spring, channel or stream**. The water in a lotic ecosystem, from source to mouth, must have atmospheric gases, turbidity, longitudinal temperature gradation and material dissolved in it. **Hence, options 1 and 4 are correct.**

Q 78.A

- Decomposers breakdown complex organic matter into inorganic substances like carbon dioxide, water and nutrients, and the process is called decomposition.
- Dead plant remains such as leaves, bark, flowers and dead remains of animals, including fecal matter, constitute detritus, which is the raw material for decomposition.
- The important steps in the process of decomposition are
  - **Fragmentation**: Detritivores (e.g., earthworms) break down detritus into smaller particles.
  - **Leaching**: Water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. **Hence, pair 1 is correctly matched.**
  - **Catabolism**: Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. **Hence, pair 3 is not correctly matched.**
  - **Humification**: It leads to the accumulation of a dark-colored amorphous substance called humus that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate. Being colloidal in nature it serves as a reservoir of nutrients.
  - **Mineralization**: Humus is further degraded by some microbes and the release of inorganic nutrients occurs. **Hence, pair 2 is not correctly matched.**
- **Hence, option (a) is the correct answer.**

Q 79.B

- Human activities like deforestation and burning of fossil fuels are the major factors that have induced climatic changes and resultant effects
- Deforestation affects the local climate of an area by reducing the evaporative cooling that takes place from both soil and plant life. Evaporation and evapo-transpiration processes from the trees and plants return

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large quantities of water to the atmosphere, promoting cloud formation and rains. Less evaporation means that more of the sun's energy is used to warm the surface and consequently, the air above, leading to a rise in temperature. **Hence, the destruction of the ecosystem will result in a decline in evapo-transpiration. Hence option 1 is not correct.**

- Increasing amount of forest in removal also result decreasing amount of rainfall. **Decreased rainfall reduces the percolation of water in the underground and consequently lowers the levels of the underground water table.** All this leads to the drying up of rivers, streams, lakes and aquifers. **Hence option 2 is correct.**
- The increase in CO2, in the atmosphere and the resultant increase in temperatures also leads to increasing frequency of floods and droughts.
- Loss of vegetative cover also leads the rainwater to runoff rapidly over the surface causing floods. Floods wash away the topsoil cover, devoiding the soil of its nutrients and thereby, its fertility. Loss of soil productivity by erosion of topsoil results in the formation of deserts.
- Human activities cause the majority of threats to species, sites and habitats. **Habitat destruction and land conversion for agricultural and forestry activities and associate degradation and fragmentation result in the loss of biospecies and loss of biomass. Hence option 3 is correct.**

Q 80.A

- No species can live in isolation in a habitat and results in Interspecific interactions that arise from the interaction of populations of two different species. **These interactions could be beneficial, detrimental, or neutral** to one of the species or both. In nature, animals, plants, and microbes interact in various ways to form a biological community. Many interactive linkages exist even in minimal communities.

Species A	Species B	Name of Interaction
+	+	*Mutualism*
–	–	*Competition*
+	–	*Predation*
+	–	*Parasitism*
+	0	*Commensalism*
–	0	*Amensalism*

- **+ sign denotes Beneficial interactions**
- **- sign denotes Detrimental Interactions**
- **0 denotes neutral Interactions**
- **Pitcher plant-eating insects is an example of Predation** where Species A (Pitcher plant) is getting the benefit at the cost of species B (Insect) where Pitcher plant is predator and insect is prey.
- **Plants in the evergreen forests are fighting for sunlight**, which negatively affects their growth. It is an example of **competitive interaction** where plants are competing for the same source i.e. sunlight.
- **Cattle egret and grazing cattle is an example of commensalism.** The egrets always feed close to where the cattle are grazing, As they get some of their nutrition by feeding on these ticks and mites that were stirred up by the movement of cattle and grazing of grass that might be difficult for the egrets to find and catch otherwise.
- **Sparrow-eating seed is an example of Predation** where sparrow is getting benefited at the cost of seeds.

Q 81.A

- The Water (Prevention and Control of Pollution) Act, 1974 defined terms like pollution, sewage effluent, trade effluent, stream, and boards. It defines water pollution and water quality standards. **Hence statement 1 is correct.**
- The Act has the following objectives:
  - To prevent and control water pollution.
  - To maintain or to restore the wholesomeness of water.
  - To establish Boards for the prevention and control of water pollution.
    - ✓ Central Pollution Control Board and State Pollution Control Board to implement the work for the objectives of the Act. **Hence statement 3 is not correct.**
- The Act provides for maintenance and restoration of quality of all types of surface and groundwater. **Hence statement 2 is correct.**
- The Act prohibits the disposal of any poisonous, noxious, or polluting matter to the flow of water in a stream. However, dumping any material into a stream for the purpose of reclamation of land is not considered an offense.

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- The Act provides for severe and deterrent punishments for violation of the Act which includes fines and imprisonment.

Q 82.B

- **Recently, India has gifted the holy relics of 17th century Queen St. Ketevan to the Georgian government, nearly 16 years after they were found in Goa.**
- The Black Sea, also known as the Euxine Sea, is one of the major inland seas of the world. Major rivers such as the Danube, Dnieper, and Don drain into the Black Sea.
- **The Black Sea is bordered by Bulgaria, Georgia, Romania, Russia, Turkey, and Ukraine.**

- **Hence, option (b) is the correct answer.**

Q 83.D

- A **food chain is a linear sequence of organisms through which nutrients and energy pass as one organism eats another.** The levels in the food chain are producers, primary consumers, higher-level consumers, and finally decomposers. These levels are used to describe ecosystem structure and dynamics. There is a single path through a food chain. **Each organism in a food chain occupies a specific trophic level (energy level), its position in the food chain.**
- One major factor that limits the number of steps in a food chain is energy. **Energy is lost at each trophic level** and between trophic levels as heat and in the transfer to decomposers. The loss of energy can be in the form of respiration and excretion also. **Hence statement 2 is not correct.**
- Generally, two types of food chains are recognized: 1. Grazing Food Chain 2. Detritus Food Chain.
- In a **Grazing Food Chain**, the **first level starts with plants as producers** and ends with carnivores as consumers at the last level, with the herbivores being at the intermediate level. **Hence statement 1 is not correct.** A **Detritus food chain** is based on autotrophs energy capture initiated by grazing animals and involves the decomposition or **breaking down of organic wastes and dead matter** derived from the grazing food chain.

Q 84.C

- **In the recently held 11th Mekong-Ganga Cooperation (MGC) meeting, India has called for a "collective and collaborative" response to effectively deal with coronavirus pandemic saying the virus does not respect national boundaries.**
- **The MGC was launched in 2000 to boost cooperation in a range of areas including connectivity, tourism and culture and transport.**
- **Its members include**
  - **India**
  - Cambodia
  - Myanmar
  - **Thailand**
  - Laos
  - **Vietnam**
- The organization takes its name from the Ganga and the Mekong, two large rivers in the region.
- The working mechanism for MGC consists of the Annual Ministerial Meeting, the Senior Official's Meeting, and the five Working Groups.
- **Hence, option (c) is the correct answer.**

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Q 85.D

- An important characteristic of all communities is that their composition and structure constantly change in response to the changing environmental conditions. This change is orderly and sequential, parallel with the changes in the physical environment. These changes lead finally to a community that is in near equilibrium with the environment and that is called a climax community.
- The gradual and fairly predictable change in the species composition of a given area is called ecological succession.
- During succession, some species colonize an area and their population becomes more numerous whereas populations of other species decline and even disappear.
- The entire sequence of communities that successively change in a given area is called sere(s). The individual transitional communities are termed seral stages or seral communities.
- In the successive seral stages, the following phenomenons are observed:
  - Change in the diversity of species of organisms
  - **Increase in the number of species**
  - **Increase in the number of organisms**
  - **increase in the total biomass**
- **Hence, option (d) is the correct answer.**

Q 86.B

- **Recently, China has reported the first human infection case with Monkey B virus (BV).**
- The virus, initially isolated in 1932, is an Alpha Herpes Virus enzootic in macaques of the genus Macaca. Monkey B virus is the only identified old-world-monkey herpes virus that displays severe pathogenicity in humans.
- According to the Centre for Disease Control and Prevention, macaque monkeys commonly have this virus, and it can be found in their saliva, feces, urine, or brain or spinal cord tissue.
- **The infection can be transmitted via direct contact and exchange of bodily secretions of monkeys and has a fatality rate of 70 percent to 80 percent.**
- **Humans can get infected if they are bitten or scratched by an infected monkey; get an infected monkey's tissue or fluid on broken skin or in the eyes, nose, or mouth. Hence, statement 1 is not correct.**
- Symptoms typically start within one month of being exposed to the virus but could appear in as little as three to seven days.
- The first indications of virus infection are typically flu-like symptoms such as fever and chills, muscle ache, fatigue, and headache, following which an infected person may develop small blisters in the wound or area on the body that came in contact with the monkey.
- As the disease progresses, the virus spreads to and causes inflammation (swelling) of the brain and spinal cord, leading to neurologic and inflammatory symptoms such as pain, numbness, itching near the wound site; issues with muscle coordination; brain damage, and severe damage to the nervous system and in extreme cases, death.
- **Currently, there are no vaccines that can protect against Monkey B virus infection. Hence, statement 2 is correct.**

Q 87.D

- Wildlife Crime Control Bureau is a **statutory** multi-disciplinary body established by the Government of India **under the Ministry of Environment and Forests**, to combat organized wildlife crime in the country. **Hence statement 1 is correct**.
- The Bureau has its **headquarter in New Delhi**
  - five regional offices at Delhi, Kolkata, Mumbai, Chennai and Jabalpur;
  - three sub-regional offices at Guwahati, Amritsar, and Cochin;
  - five border units at Ramanathapuram, Gorakhpur, Motihari, Nathula and Moreh.
- **It is the primary enforcers of the Wildlife Protection Act, 1972.**
- **Under the Wild Life (Protection) Act, 1972, it is mandated:**
  - to collect and collate intelligence related to organized wildlife crime activities and to disseminate the same to State and other enforcement agencies for immediate action so as to apprehend the criminals;
  - to establish a centralized wildlife crime data bank;
  - co-ordinate actions by various agencies in connection with the enforcement of the provisions of the Act;
  - assist foreign authorities and international organizations concerned to facilitate coordination and universal action for wildlife crime control; **Hence statement 2 is correct.**

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- capacity building of the wildlife crime enforcement agencies for a scientific and professional investigation into wildlife crimes and assist State Governments to ensure success in prosecutions related to wildlife crimes;
- and advise the Government of India on issues relating to wildlife crimes having national and international ramifications, relevant policy and laws.

- **It also assists and advises the Customs authorities in inspection of the consignments of flora & fauna as per the provisions of Wild Life Protection Act, CITES and EXIM Policy governing such an item.**

Q 88.C

- Solar energy is a non-conventional energy source.
- Solar energy can be converted into other forms by two methods:
  - **The Photovoltaic Method:** The sun's energy is directly converted into electricity using a photovoltaic cell. The electricity produced by this method is used for street lightening, radio and television, lightening houses, water pumps, sprayers etc. **Hence, statement 1 is correct.**
  - **The Thermal Method:** The solar radiation in the form of heat is converted into mechanical, electrical or chemical energy by using solar thermal devices like cookers, heaters etc. The solar thermal devices are solar cookers, solar water heaters, solar dryers, solar refrigeration etc. **Hence, statement 2 is correct.**

Q 89.C

- The **aphotic zone** is the portion of a lake or ocean where there is little or no sunlight. It is formally defined as the depths beyond which less than 1 percent of sunlight penetrates. Above the aphotic zone is the photic zone. **Unusual and unique creatures dwell in this expanse of pitch-black water, such as the gulper eel, the giant squid, the anglerfish, and the vampire squid. Some of the lives in the aphotic zone do not rely on sunlight at all.** Benthic communities around methane seeps rely on methane-oxidizing microorganisms to supply energy to other microorganisms. **Hence statement 1 is not correct**
- Tides are driven by the gravitational pull of the moon create a unique marine ecosystem known as the intertidal zone where animals must be able to survive waves and daily dry periods. **Tides affect marine ecosystems by influencing the kinds of plants and animals that thrive in what is known as the intertidal zone—the area between high and low tide.** Because the area is alternately covered and uncovered by the ocean throughout the day, plants and animals must be able to survive both underwater and out in the air and sunlight. They must also be able to withstand crashing waves. **Hence statement 2 is not correct**
- **Hence option (c) is the correct answer**

Q 90.D

- **Particulates pollutants** are the **minute solid particles or liquid droplets** in the air. These are present in **vehicle emissions, smoke particles from fires**, dust particles, and ash from industries. Particulates in the atmosphere may be viable or non-viable. The **viable particulates e.g., bacteria, fungi, molds, algae,** etc., are minute living organisms that are dispersed in the atmosphere. Human beings are allergic to some of the fungi found in the air. They can also cause plant diseases.
- **Non-viable particulates** may be classified according to their nature and size as follows:
  - **Smoke particulates** consist of a solid or mixture of solid and liquid particles formed during the combustion of organic matter. Examples are **cigarette smoke,** smoke from the burning of fossil fuel, garbage, and dry leaves, oil smoke, etc.
  - **Dust** is composed of **fine solid particles** (over 1μm in diameter), produced during the crushing, grinding, and attribution of solid materials. **Sand from sandblasting,** sawdust from woodworks, **pulverized coal,** cement, and fly ash from factories, dust storms, etc., are some typical examples of this type of particulate emission.
  - **Mists** are produced by particles of **spray liquids** and by condensation of vapors in air. Examples are sulphuric acid mist and **herbicides and insecticides** that miss their targets and travel through air and form mists.
  - **Fumes** are generally obtained by the condensation of vapors during sublimation, distillation, boiling, and several other chemical reactions. Generally, **organic solvents, metals, and metallic oxides** form fume particles.
  - **Hence option (d) is the correct answer.**
- The **effect** of particulate pollutants is largely **dependent on the particle size.** Air-borne particles such as dust, fumes, mist, etc., are dangerous for human health. Particulate pollutants bigger than 5 microns are likely to lodge in the nasal passage, whereas particles of about 10 microns enter into the lungs easily.

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Q 91.A

Traditional Water Harvesting Systems	
States	**Name of Traditional Water Harvesting System**
Rajasthan	Kunds
Gujarat	Tankas
Maharashtra	Phad System
Andhra Pradesh	Tanks and Anicuts
Orissa	Katas
Karnataka	Teluparagis and Kere
Western Himalayas	Khatri or Kuhl
Gangetic plains	Baolis or Dighis
Central India	Johads
Western Ghats	Surangam
Eastern Ghats	Korambu
Ladakh	Zing

- **Hence option (a) is the correct answer.**

Q 92.D

- A Watershed is the reservoir in which the rainwater falling on a vast hilly area is made to accumulate for recharging the water table and for keeping it reserved for domestic and agricultural purposes of local communities.
- In watershed development, the water is conserved at the source i.e. the rainwater falling on hills is stored and conserved in valleys. Civil structures like contour bunds, trenches, gully plugs, check dams and percolation tanks are constructed to conserve water and to recharge the groundwater.
- The Integrated Watershed Management covers different areas of the environment which are listed below-
  - **Management of soil and water,**
  - Development of sustainable agriculture,
  - Improvement in cattle rearing or the animal husbandry,
  - **Development of fodder for cattle,**
  - **Development of Agro-forestry** i.e. growing commercially useful trees on demarcation lines of crop fields,
  - Management of rural energy, and
  - Development of community.
- **Hence option (d) is the correct answer.**

Q 93.D

- **Project BOLD (Bamboo Oasis on Lands in Drought) seeks to create bamboo-based green patches in arid and semi-arid land zones and thus reducing land degradation and desertification in the country.**
- **It has been launched by Khadi and Village Industries Commission (KVIC) as part of KVIC's "Khadi Bamboo Festival" to celebrate 75 years of independence.**
- KVIC has judiciously chosen bamboo for developing green patches. Bamboos grow very fast and in about three years' time, they could be harvested. Bamboos are also known for conserving water and reducing evaporation of water from the land surface, which is an important feature in arid and drought-prone regions.
- **Hence, option (d) is the correct answer.**

Q 94.D

- Phosphorus is a chemical element with the symbol P and atomic number 15. Elemental phosphorus exists in two major forms, white phosphorus and red phosphorus, but because it is highly reactive, phosphorus is usually never found as a free element on Earth.

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- Phosphorus is used in the manufacture of safety matches (red phosphorus), pyrotechnics and incendiary shells. Phosphorus is also used in steel manufacture and in the production of phosphor bronze. Phosphates are ingredients of some detergents. Phosphorus is used to make light-emitting diodes (LEDs).
- In living organisms, Phosphorous is used in ATP to transport energy, in bones to provide rigidity, in DNA as the supportive backbone and in the cell membranes to control diffusion.
- Phosphorus mineral has multiple applications:
  - fertilizers
  - detergents
  - medicine
  - safety matches (match sticks)
  - steel manufacture
  - LEDs (light-emitting diodes) etc
- **Hence, option (d) is the correct answer.**

Q 95.B

- **Biodiversity prospecting or bioprospecting** is the systematic search for biochemical and genetic information in nature in order to develop commercially valuable products for pharmaceutical, agricultural, cosmetic and other applications. **Hence option (b) is the correct answer.**
- The illegal collection and patenting of the biological materials originally belonging to some other community, state, or nation; is called bio-piracy.
- The term Bio-piracy relates to-
  - illegal unauthorized use of biological material like plants, animals, or their products,
  - illegal and unauthorized use of traditional knowledge of some other society or community about the application of the certain biological product(s),
  - unlawful sharing in the benefits by the patent holder and deprivation of indigenous communities or people who are the real owner of the biological material/knowledge used for making benefits.
- **Bio-Patenting** is the act of gaining an official right of ownership. By patenting anything or any biological material, a person, a corporation, a research institution or a country gains the officially legal authority of being the only owner of that thing or the biological material.

Q 96.A

- The Union Cabinet, chaired by the Prime Minister has approved a Reforms-based and Results-linked, Revamped Distribution Sector Scheme on June 30th, 2021.
- **This Scheme seeks to improve the operational efficiencies and financial sustainability of all DISCOMs/ Power Departments excluding Private Sector DISCOMs by providing conditional financial assistance to DISCOMs for strengthening of supply infrastructure. Hence, statement 1 is correct.**
- The assistance will be based on meeting pre-qualifying criteria as well as upon achievement of basic minimum benchmarks by the DISCOM evaluated on the basis of agreed evaluation framework tied to financial improvements.
- It is also proposed that the currently ongoing approved projects under the Schemes of Integrated Power Development Scheme (IPDS), Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) would be subsumed in this Scheme.
- **Objectives of the Scheme are:**
  - Reduction of AT&C losses to pan-India levels of 12-15% by 2024-25.
  - Reduction of ACS-ARR gap to zero by 2024-25. (Average Cost of Supply (ACS)-Average Revenue Realised (ARR))
  - Developing Institutional Capabilities for Modern DISCOMs.
  - Improvement in the quality, reliability, and affordability of power supply to consumers through a financially sustainable and operationally efficient Distribution Sector.
- **Rural Electrification Corporation (REC) and Power Finance Corporation (PFC) are the nodal agencies for the implementation of the Scheme. Hence, statement 2 is not correct.**
- **Major components of the scheme**
  - **Consumer Meters and System Meters**
    - ✓ Consumer empowerment by way of prepaid Smart metering to be implemented in Public-Private-Partnership (PPP) mode.
    - ✓ 25 crore consumers to be covered under prepaid Smart metering
    - ✓ Prioritizing the urban areas, UTs, AMRUT cities and High Loss areas for prepaid Smart metering

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- **Feeder Segregation**
  - ✓ The scheme also focuses on funding for feeder segregation for unsegregated feeders, which would enable solarization under KUSUM.
  - ✓ Solarization of feeders will lead to cheap/ free daytime power for irrigation and additional income for the farmers
- **Modernization of Distribution system in urban areas**.
  - ✓ It is proposed to take up System metering at Feeder and Distribution Transformer (DT) level with communicating features simultaneously in PPP mode.
- **Rural and Urban area System strengthening.**

Q 97.C

- **Recently, the historical fort cities of Gwalior and Orchha in Madhya Pradesh have been selected by UNESCO under its 'Historic Urban Landscape Project'.**
- Historic Urban Landscape Project' was started in the year 2011, for the inclusive and well-planned development of fast-growing historical cities while preserving the culture and heritage.
  - Historic Urban Landscape (HUL) is an integrated approach towards managing heritage resources found within dynamic and evolving environments.
  - HUL acknowledges the layering of interconnections within a city, which occur between the built and natural environments, the tangible and intangible values, as well as within the cultural and social practices of a community.
  - This approach considers these factors as key pillars towards sustainable urban heritage management and the development of the city
- These cities will be jointly developed by UNESCO, the Government of India and Madhya Pradesh by focusing on their historical and cultural improvement.
- **Gwalior** was established in 9th century and ruled by Gurjar Pratihar Rajvansh, Tomar, Baghel Kachvaho, and Scindias.
  - Gwalior is known for its palaces and temples, including the intricately carved Sas Bahu Ka Mandir temple.
- **Orchha** is popular for its temples and palaces and was the capital of the Bundela kingdom in the 16th century.
  - The famous spots in the town are Raj Mahal, Jehangir Mahal, Ramraja Temple, Rai Praveen Mahal, and Laxminarayan Mandir
- **Varanasi, Hyderabad, Ajmer-Pushkar are already included under this project as pilot cities.**
- **Hence, option (c) is the correct answer.**

Q 98.A

- **Bandipur National Park** was formed by including the areas of erstwhile Venugopala Wildlife Park. It was later brought under Project Tiger in 1973. It along with Mudumalai Wildlife Sanctuary, Wayanad Wildlife Sanctuary, and Nagarhole National Park constitute India's largest biosphere reserve Nilgiri Biosphere Reserve. It is also home to species like gaur, mouse deer, sloth bear, and Malabar squirrel, etc.

Q 99.A

- **Air pollutant means** any solid, liquid, or gaseous substance **(including noise)** present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.
  - **Air pollution means** the presence in the atmosphere of any air pollutant.
- The Air Act was passed under **Article 253** of the Constitution of India and in pursuance of decisions of the **Stockholm Conference.**
  - To provide means for the prevention, control, and abatement of air pollution in order to preserve the quality of air.
  - **The Act was amended in 1987 to include noise as an air pollutant. Hence statement 2 is correct.**
  - Any air pollutant into the atmosphere by a ship or aircraft does not come under the purview of this Act. **Hence statement 3 is correct.**
  - The Act specifically empowers State Government to designate air pollution areas and to prescribe the type of fuel to be used in these designated areas.
  - **The Air Act, 1981 only confers power to CPCB for the prevention and control of air pollution under this Act.**
    - ✓ It is mentioned in the act "The Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974 shall, without prejudice to the exercise and

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performance of its powers and functions under that Act, exercise the powers and perform the functions of the Central Pollution Control Board for the prevention and control of air pollution under this Act". **Hence statement 1 is not correct.**

- The Act provides the declaration of certain heavily polluted areas as Air pollution control areas and no industrial plant shall be operated in these areas without prior consent of the State Pollution Control Board.

Q 100.B

- Parasitism is a relationship between two species of animals or plants in which one benefits at the disadvantage of the other, sometimes without killing the host life form.
- Parasites are classified based on their characteristics, size, and relationship with the host life form. There are different types of parasitism and they are as follows:
  - **Brood parasitism**
    - ✓ It involves raising the young ones.
    - ✓ Some bird species like cuckoos and cowbirds practice brood parasitism by **laying their eggs in the nest of its host and lets the host incubates them.** During the course of evolution, the eggs of the parasitic bird have evolved to resemble the host's egg in size and color to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest. **Hence, option (b) is the correct answer.**
  - **Ectoparasitism**
    - ✓ Parasites that feed on the external surface of the host organism are called ectoparasites.
    - ✓ The most familiar examples of this group are the lice on humans and ticks on dogs.
    - ✓ Many marine fish are infested with ectoparasitic copepods.
    - ✓ Cuscuta, a parasitic plant that is commonly found growing on hedge plants, has lost its chlorophyll and leaves in the course of evolution. It derives its nutrition from the host plant which it parasitises.
  - **Endoparasitism**
    - ✓ Endoparasites are those that live inside the host body at different sites (liver, kidney, lungs, red blood cells, etc.).
    - ✓ The life cycles of endoparasites are more complex because of their extreme specialization.
    - ✓ Their morphological and anatomical features are greatly simplified while emphasising their reproductive potential.
  - **Obligate Parasitism**
    - ✓ Obligate parasites are wholly reliant on the host organism in order for them to survive.
    - ✓ Over time, they have developed so that they will be unable to complete their life cycle without the existence of the host organism.
    - ✓ Since the parasites need to survive, they usually will not cause severe damage to the host, except the host's death is required for the transmission of the parasite.
    - ✓ Obligate parasitism will be found in various types of living beings like animals, fungi, plants, viruses, and bacteria.

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